

Supporting Information 2-code

The simulation of interface characteristics and charge transfer dynamics for layered electrodes using cascade capacitance in supercapacitors by COMSOL software

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Introduction:

Supporting information 2 was code of simulation model, this code can be run in MATLAB 2024 software (<https://www.mathworks.com/products/matlab.html>) after connecting COMSOL with MATLAB.

```

function out = model
%
% Supporting_information.m
%
% Model exported on Dec 3 2024, 12:54 by COMSOL 6.2.0.290.

import com.comsol.model.*
import com.comsol.model.util.*

model = ModelUtil.create('Model');

model.modelPath('C:\Users\lenovo\Desktop');

model.component.create('comp1', true);

model.component('comp1').geom.create('geom1', 2);
model.component('comp1').geom('geom1').axisymmetric(true);

model.component('comp1').mesh.create('mesh1');

model.component('comp1').physics.create('cd', 'SecondaryCurrentDistribution', 'geom1');

model.study.create('std1');
model.study('std1').create('time', 'Transient');
model.study('std1').feature('time').setSolveFor('/physics/cd', true);

model.component('comp1').geom('geom1').create('r1', 'Rectangle');
model.component('comp1').geom('geom1').feature('r1').set('size', [2 10]);
model.component('comp1').geom('geom1').run('r1');
model.component('comp1').geom('geom1').lengthUnit('nm');
model.component('comp1').geom('geom1').lengthUnit('mm');
model.component('comp1').geom('geom1').feature.duplicate('r2', 'r1');
model.component('comp1').geom('geom1').feature('r2').set('size', [1 10]);
model.component('comp1').geom('geom1').run('r2');
model.component('comp1').geom('geom1').feature('r2').set('pos', [2 0]);
model.component('comp1').geom('geom1').run('r2');
model.component('comp1').geom('geom1').feature.duplicate('r3', 'r1');
model.component('comp1').geom('geom1').feature('r3').set('pos', [3 0]);
model.component('comp1').geom('geom1').run('r3');
model.component('comp1').geom('geom1').run;

model.component('comp1').material.create('mat1', 'Common');
model.component('comp1').material('mat1').propertyGroup('def').func.create('int1',
'Interpolation');

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model.component('comp1').material('mat1').propertyGroup('def').func.create('int2',
'Interpolation');
model.component('comp1').material('mat1').propertyGroup.create('ElectrodePotential',
'Equilibrium potential');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func.create(
'int1', 'Interpolation');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func.create(
'int2', 'Interpolation');
model.component('comp1').material('mat1').propertyGroup.create('OperationalSOC',
'Operational electrode state of charge');
model.component('comp1').material('mat1').propertyGroup.create('ic', 'Intercalation strain');
model.component('comp1').material('mat1').propertyGroup('ic').func.create('int1',
'Interpolation');
model.component('comp1').material('mat1').propertyGroup.create('EquilibriumConcentration',
'Equilibrium concentration');
model.component('comp1').material('mat1').label('Graphite, LixC6 MCMB (Negative, Li-ion
Battery)');
model.component('comp1').material('mat1').propertyGroup('def').label('Basic');
model.component('comp1').material('mat1').propertyGroup('def').func('int1').label('Interpolat
ion 1');
model.component('comp1').material('mat1').propertyGroup('def').func('int1').set('funcname',
'E_int');
model.component('comp1').material('mat1').propertyGroup('def').func('int1').set('table', {'0'
'32.47'; '0.333' '28.56'; '0.5' '58.06'; '1' '108.67'});
model.component('comp1').material('mat1').propertyGroup('def').func('int1').set('fununit',
{'GPa'});
model.component('comp1').material('mat1').propertyGroup('def').func('int1').set('argunit',
{'1'});
model.component('comp1').material('mat1').propertyGroup('def').func('int2').label('Interpolat
ion 2');
model.component('comp1').material('mat1').propertyGroup('def').func('int2').set('funcname',
'nu_int');
model.component('comp1').material('mat1').propertyGroup('def').func('int2').set('table', {'0'
'0.32'; '0.333' '0.39'; '0.5' '0.34'; '1' '0.24'});
model.component('comp1').material('mat1').propertyGroup('def').func('int2').set('fununit',
{''});
model.component('comp1').material('mat1').propertyGroup('def').set('youngsm modulus', '');
model.component('comp1').material('mat1').propertyGroup('def').set('poissonsratio', '');
model.component('comp1').material('mat1').propertyGroup('def').set('youngsm modulus',
'E_int(c/csmx)');
model.component('comp1').material('mat1').propertyGroup('def').set('INFO_PREFIX:youngsm
odulus', 'Yue Qi et al 2010 J. Electrochem. Soc. 157 A558');
model.component('comp1').material('mat1').propertyGroup('def').set('poissonsratio',
'nu_int(c/csmx)');

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model.component('comp1').material('mat1').propertyGroup('def').set('INFO_PREFIX:poissons
ratio', 'Yue Qi et al 2010 J. Electrochem. Soc. 157 A558');
model.component('comp1').material('mat1').propertyGroup('def').set('electricconductivity',
{'100[S/m]' '0' '0' '0' '100[S/m]' '0' '0' '0' '100[S/m]'});
model.component('comp1').material('mat1').propertyGroup('def').set('INFO_PREFIX:electricc
onductivity', ['V. Srinivasan, and J. Newman, ' native2unicode(hex2dec({'20' '1c'}), 'unicode')
'Design and Optimization of a Natural Graphite/Iron Phosphate Lithium Ion Cell,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Electrochem. Soc., vol. 151, p. 1530,
2004.']);
model.component('comp1').material('mat1').propertyGroup('def').set('diffusion', {'1.4523e-
13*exp(68025.7/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]' '0' '0' '0' '1.4523e-
13*exp(68025.7/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]' '0' '0' '0' '1.4523e-
13*exp(68025.7/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]'});
model.component('comp1').material('mat1').propertyGroup('def').set('INFO_PREFIX:diffusion'
, ['K. Kumaresan, G. Sikha, and R. E. White, ' native2unicode(hex2dec({'20' '1c'}), 'unicode')
'Thermal Model for a Li-Ion Cell,' native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J.
Electrochem. Soc., vol. 155, p. A164, 2008.']);
model.component('comp1').material('mat1').propertyGroup('def').set('thermalconductivity',
{'1[W/(m*K)]' '0' '0' '0' '1[W/(m*K)]' '0' '0' '0' '1[W/(m*K)]'});
model.component('comp1').material('mat1').propertyGroup('def').set('INFO_PREFIX:thermalc
onductivity', 'S. Chen, C. Wan, and Y. Wang, J. Power Sources, 140, 111 (2005).');
model.component('comp1').material('mat1').propertyGroup('def').set('heatcapacity',
'750[J/(kg*K)]');
model.component('comp1').material('mat1').propertyGroup('def').set('INFO_PREFIX:heatcapa
city', 'SI Chemical Data, John Wiley & Sons, 1994');
model.component('comp1').material('mat1').propertyGroup('def').set('density',
'2300[kg/m^3]');
model.component('comp1').material('mat1').propertyGroup('def').set('INFO_PREFIX:density',
'SI Chemical Data, John Wiley & Sons, 1994');
model.component('comp1').material('mat1').propertyGroup('def').set('csmax',
'31507[mol/m^3]');
model.component('comp1').material('mat1').propertyGroup('def').descr('csmax', '');
model.component('comp1').material('mat1').propertyGroup('def').set('T_ref', '318[K]');
model.component('comp1').material('mat1').propertyGroup('def').descr('T_ref', '');
model.component('comp1').material('mat1').propertyGroup('def').set('T2',
'min(393.15,max(T,223.15))');
model.component('comp1').material('mat1').propertyGroup('def').descr('T2', '');
model.component('comp1').material('mat1').propertyGroup('def').addInput('temperature');
model.component('comp1').material('mat1').propertyGroup('def').addInput('concentration');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').label('Equili
brium potential');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int1').l
abel('Interpolation 1');

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model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int1').
set('funcname', 'Eeq_int1');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int1').
set('table', {'0' '2.781186612'; ...
'0.01' '1.520893224'; ...
'0.02' '0.893922607'; ...
'0.03' '0.581284406'; ...
'0.04' '0.42452844'; ...
'0.05' '0.344895805'; ...
'0.06' '0.303146342'; ...
'0.07' '0.279578072'; ...
'0.08' '0.264093089'; ...
'0.09' '0.251347845'; ...
'0.1' '0.238588379'; ...
'0.11' '0.224803164'; ...
'0.12' '0.210294358'; ...
'0.13' '0.196408586'; ...
'0.14' '0.184624188'; ...
'0.15' '0.175188157'; ...
'0.16' '0.167373311'; ...
'0.17' '0.160452107'; ...
'0.18' '0.154025412'; ...
'0.19' '0.147948522'; ...
'0.2' '0.142214997'; ...
'0.21' '0.13688271'; ...
'0.22' '0.132033114'; ...
'0.23' '0.127747573'; ...
'0.24' '0.124091616'; ...
'0.25' '0.121103387'; ...
'0.26' '0.11878567'; ...
'0.27' '0.117102317'; ...
'0.28' '0.115980205'; ...
'0.29' '0.115317054'; ...
'0.3' '0.114993965'; ...
'0.31' '0.114890105'; ...
'0.32' '0.114886278'; ...
'0.33' '0.114884619'; ...
'0.34' '0.114873068'; ...
'0.35' '0.114824904'; ...
'0.36' '0.114644725'; ...
'0.37' '0.114372614'; ...
'0.38' '0.114017954'; ...
'0.39' '0.11359371'; ...
'0.4' '0.11311133'; ...

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'0.41' '0.112575849'; ...
 '0.42' '0.111980245'; ...
 '0.43' '0.111297682'; ...
 '0.44' '0.110470149'; ...
 '0.45' '0.109393081'; ...
 '0.46' '0.107900592'; ...
 '0.47' '0.10576964'; ...
 '0.48' '0.102783317'; ...
 '0.49' '0.09889031'; ...
 '0.5' '0.094391564'; ...
 '0.51' '0.089921069'; ...
 '0.52' '0.086112415'; ...
 '0.53' '0.083265315'; ...
 '0.54' '0.081326247'; ...
 '0.55' '0.080074892'; ...
 '0.56' '0.07928329'; ...
 '0.57' '0.078778765'; ...
 '0.58' '0.078447703'; ...
 '0.59' '0.078220432'; ...
 '0.6' '0.078055641'; ...
 '0.61' '0.077929111'; ...
 '0.62' '0.077826563'; ...
 '0.63' '0.077739397'; ...
 '0.64' '0.077662227'; ...
 '0.65' '0.077591472'; ...
 '0.66' '0.077524557'; ...
 '0.67' '0.077459463'; ...
 '0.68' '0.077394455'; ...
 '0.69' '0.077327934'; ...
 '0.7' '0.077258337'; ...
 '0.71' '0.077184077'; ...
 '0.72' '0.077103499'; ...
 '0.73' '0.077014851'; ...
 '0.74' '0.076916258'; ...
 '0.75' '0.07680571'; ...
 '0.76' '0.07668104'; ...
 '0.77' '0.07653992'; ...
 '0.78' '0.076379839'; ...
 '0.79' '0.076198086'; ...
 '0.8' '0.075991699'; ...
 '0.81' '0.075757371'; ...
 '0.82' '0.075491288'; ...
 '0.83' '0.075188813'; ...
 '0.84' '0.07484398'; ...

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'0.85' '0.074448647'; ...
'0.86' '0.07399118'; ...
'0.87' '0.073454466'; ...
'0.88' '0.072812991'; ...
'0.89' '0.072028722'; ...
'0.9' '0.071045433'; ...
'0.91' '0.069780996'; ...
'0.92' '0.068116222'; ...
'0.93' '0.065874599'; ...
'0.94' '0.062770873'; ...
'0.95' '0.058253898'; ...
'0.96' '0.051075794'; ...
'0.97' '0.038790069'; ...
'0.98' '0.020172191'});
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int1').
set('interp', 'piecewisecubic');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int1').
set('extrap', 'linear');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int1').
set('fununit', {'V'});
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int1').
set('argunit', {''});
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int1').
set('defineinv', true);
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int1').
set('funcinvname', 'Eeq_inv');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int2').l
abel('Interpolation 2');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int2').
set('funcname', 'dEeqdT_int1');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int2').
set('table', {'0' '3.0e-4'; ...
'0.17' '0'; ...
'0.24' '-6e-5'; ...
'0.28' '-1.6e-4'; ...
'0.5' '-1.6e-4'; ...
'0.54' '-9e-5'; ...
'0.71' '-9e-5'; ...
'0.85' '-1.0e-4'; ...
'1.0' '-1.2e-4'});
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int2').
set('fununit', {'V/K'});
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').func('int2').
set('argunit', {''});

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model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').set('Eeq',
'Eeq_int1(soc)+dEeqdT_int1(soc)*(T-298[K]);
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').set('INFO_P
REFIX:Eeq', ['D. P. Karthikeyan, G. Sikha, and R. E. White, ' native2unicode(hex2dec({'20' '1c'}),
'unicode') 'Thermodynamic model development for lithium intercalation electrodes,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Power Sources, vol. 185, p. 1398, 2008.']);
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').set('dEeqdT
', 'dEeqdT_int1(soc);
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').set('INFO_P
REFIX:dEeqdT', ['K. E. Thomas, and J. Newman, ' native2unicode(hex2dec({'20' '1c'}),
'unicode') 'Heats of mixing and of entropy in porous insertion electrodes,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Power Sources., vol. 119-121, p. 844,
2003.']);
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').set('cEeqref
', 'def.csmax');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').set('soc',
'c/cEeqref');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').descr('soc',
'');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').addInput('c
oncentration');
model.component('comp1').material('mat1').propertyGroup('ElectrodePotential').addInput('t
emperature');
model.component('comp1').material('mat1').propertyGroup('OperationalSOC').label('Operati
onal electrode state of charge');
model.component('comp1').material('mat1').propertyGroup('OperationalSOC').set('socmax',
'elpot.Eeq_inv(E_min)');
model.component('comp1').material('mat1').propertyGroup('OperationalSOC').set('socmin',
'elpot.Eeq_inv(E_max)');
model.component('comp1').material('mat1').propertyGroup('OperationalSOC').set('E_max',
'1[V]');
model.component('comp1').material('mat1').propertyGroup('OperationalSOC').set('E_min',
'0.075[V]');
model.component('comp1').material('mat1').propertyGroup('ic').label('Intercalation strain');
model.component('comp1').material('mat1').propertyGroup('ic').func('int1').label('Interpolatio
n 1');
model.component('comp1').material('mat1').propertyGroup('ic').func('int1').set('funcname',
'dVOLdSOL');
model.component('comp1').material('mat1').propertyGroup('ic').func('int1').set('table', {'0'
'0'; ...
'0.006802721088435382' '0.12500000000000178'; ...
'0.06316812439261421' '1.2736486486486491'; ...
'0.11175898931000966' '2.523648648648649'; ...
'0.17978620019436342' '3.5709459459459474'; ...

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'0.2400388726919339' '4.449324324324325'; ...
'0.2905733722060252' '5.192567567567568'; ...
'0.3566569484936831' '5.66554054054054'; ...
'0.4188532555879494' '5.969594594594595'; ...
'0.48104956268221566' '6.10472972972973'; ...
'0.5432458697764819' '6.173648648648647'; ...
'0.58600583090379' '6.306081081081081'; ...
'0.6112730806608356' '7.726351351351352'; ...
'0.6443148688046647' '8.570945945945946'; ...
'0.694849368318756' '9.449324324324323'; ...
'0.7414965986394557' '10.29391891891892'; ...
'0.7764820213799805' '10.902027027027025'; ...
'0.8231292517006802' '11.543918918918918'; ...
'0.8542274052478133' '12.152027027027026'; ...
'0.8833819241982507' '12.827702702702702'; ...
'0.9183673469387755' '12.996621621621621'; ...
'0.9494655004859086' '13.16554054054054');
model.component('comp1').material('mat1').propertyGroup('ic').func('int1').set('extrap',
'linear');
model.component('comp1').material('mat1').propertyGroup('ic').func('int1').set('fununit',
{'%'});
model.component('comp1').material('mat1').propertyGroup('ic').func('int1').set('argunit',
{'1'});
model.component('comp1').material('mat1').propertyGroup('ic').set('dvol',
'dVOLdSOL(c/def.csmx)');
model.component('comp1').material('mat1').propertyGroup('ic').set('INFO_PREFIX:dvol', ['S.
Schweidler, L. de Biasi, A. Schiele, P. Hartmann, T. Brezesinski and J. Janek, "Volume Changes
of Graphite Anodes Revisited: A Combined Operando X-Ray Diffraction and In Situ Pressure
Analysis Study", J. Phys. Chem. C, 2018, 122, 8829' native2unicode(hex2dec({'20' '13'}),
'unicode') '8835']);
model.component('comp1').material('mat1').propertyGroup('ic').addInput('concentration');
model.component('comp1').material('mat1').propertyGroup('EquilibriumConcentration').label('Equilibrium concentration');
model.component('comp1').material('mat1').propertyGroup('EquilibriumConcentration').set('csEq', 'def.csmx*elpot.Eeq_inv(V)');
model.component('comp1').material('mat1').propertyGroup('EquilibriumConcentration').addInput('electricpotential');
model.component('comp1').material('mat1').selection.set([]);
model.component('comp1').material.create('mat2', 'Common');
model.component('comp1').material('mat2').propertyGroup('def').func.create('int1',
'Interpolation');
model.component('comp1').material('mat2').propertyGroup.create('ElectrolyteConductivity',
'Electrolyte conductivity');

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model.component('comp1').material('mat2').propertyGroup.create('SpeciesProperties',
'Species properties');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func.create(
int1, 'Interpolation');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func.create(
int2, 'Interpolation');
model.component('comp1').material('mat2').propertyGroup.create('ElectrolyteSaltConcentrat
ion', 'Electrolyte salt concentration');
model.component('comp1').material('mat2').label('LiPF6 in 1:1 EC:DEC (Liquid, Li-ion
Battery)');
model.component('comp1').material('mat2').propertyGroup('def').label('Basic');
model.component('comp1').material('mat2').propertyGroup('def').func('int1').set('source',
'file');
model.component('comp1').material('mat2').propertyGroup('def').func('int1').label('Interpolat
ion 1');
model.component('comp1').material('mat2').propertyGroup('def').func('int1').set('importedna
me', 'DL_ECDEC.txt');
model.component('comp1').material('mat2').propertyGroup('def').func('int1').set('importeddi
m', '2D');
model.component('comp1').material('mat2').propertyGroup('def').func('int1').set('funcs',
{'DL_int1' '1'});
model.component('comp1').material('mat2').propertyGroup('def').func('int1').set('fununit',
{'m^2/s'});
model.component('comp1').material('mat2').propertyGroup('def').func('int1').set('argunit', {'
'});
model.component('comp1').material('mat2').propertyGroup('def').func('int1').set('sourcetype'
, 'model');
model.component('comp1').material('mat2').propertyGroup('def').func('int1').set('nargs', '2');
model.component('comp1').material('mat2').propertyGroup('def').func('int1').set('struct',
'spreadsheet');
model.component('comp1').material('mat2').propertyGroup('def').set('diffusion',
{'DL_int1(c2/1[mol/m^3],T2/1[K])' '0' '0' '0' 'DL_int1(c2/1[mol/m^3],T2/1[K])' '0' '0' '0'
'DL_int1(c2/1[mol/m^3],T2/1[K])'});
model.component('comp1').material('mat2').propertyGroup('def').set('INFO_PREFIX:diffusion'
, ['D. Stephenson, E. Hartman, J. Harb, D. Wheeler, "Modeling of Particle-Particle Interactions
in Porous Cathodes for Lithium-Ion Batteries", J. Electrochem. Soc., vol. 154, p. A1146, 2007'
newline ]);
model.component('comp1').material('mat2').propertyGroup('def').set('c2',
'min(1500,max(c,500))');
model.component('comp1').material('mat2').propertyGroup('def').descr('c2', '');
model.component('comp1').material('mat2').propertyGroup('def').set('T2',
'min(313.15,max(T,283.15))');
model.component('comp1').material('mat2').propertyGroup('def').descr('T2', '');
model.component('comp1').material('mat2').propertyGroup('def').addInput('concentration');

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model.component('comp1').material('mat2').propertyGroup('def').addInput('temperature');
model.component('comp1').material('mat2').propertyGroup('ElectrolyteConductivity').label('Electrolyte conductivity');
model.component('comp1').material('mat2').propertyGroup('ElectrolyteConductivity').set('sigma', {'1.147[mS/cm]*exp(520[J/mol]/R_const*(1/298[K]-1/T3))*(c3/1000[mol/m^3])^3-22.38[mS/cm]*exp(1010[J/mol]/R_const*(1/298[K]-1/T3))*(c3/1000[mol/m^3])^1.5+29.15[mS/cm]*exp(1270[J/mol]/R_const*(1/298[K]-1/T3))*(c3/1000[mol/m^3])' '0' '0' '0' '1.147[mS/cm]*exp(520[J/mol]/R_const*(1/298[K]-1/T3))*(c3/1000[mol/m^3])^3-22.38[mS/cm]*exp(1010[J/mol]/R_const*(1/298[K]-1/T3))*(c3/1000[mol/m^3])^1.5+29.15[mS/cm]*exp(1270[J/mol]/R_const*(1/298[K]-1/T3))*(c3/1000[mol/m^3])' '0' '0' '0' '1.147[mS/cm]*exp(520[J/mol]/R_const*(1/298[K]-1/T3))*(c3/1000[mol/m^3])^3-22.38[mS/cm]*exp(1010[J/mol]/R_const*(1/298[K]-1/T3))*(c3/1000[mol/m^3])^1.5+29.15[mS/cm]*exp(1270[J/mol]/R_const*(1/298[K]-1/T3))*(c3/1000[mol/m^3])'});
model.component('comp1').material('mat2').propertyGroup('ElectrolyteConductivity').set('INFO_PREFIX:sigma', ['D. Stephenson, E. Hartman, J. Harb, D. Wheeler, "Modeling of Particle-Particle Interactions in Porous Cathodes for Lithium-Ion Batteries", J. Electrochem. Soc., vol. 154, p. A1146, 2007' newline ]);
model.component('comp1').material('mat2').propertyGroup('ElectrolyteConductivity').set('c3', 'min(1500,max(c,eps))');
model.component('comp1').material('mat2').propertyGroup('ElectrolyteConductivity').descr('c3', '');
model.component('comp1').material('mat2').propertyGroup('ElectrolyteConductivity').set('T3', 'min(313.15,max(T,283.15))');
model.component('comp1').material('mat2').propertyGroup('ElectrolyteConductivity').descr('T3', '');
model.component('comp1').material('mat2').propertyGroup('ElectrolyteConductivity').addInput('concentration');
model.component('comp1').material('mat2').propertyGroup('ElectrolyteConductivity').addInput('temperature');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').label('Species properties');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int1').set('source', 'file');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int1').label('Interpolation 1');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int1').set('importedname', 'transpNm_ECDEC.txt');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int1').set('importeddim', '2D');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int1').set('funcs', {'transpNm_int1' '1'});
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int1').set('fununit', {''});

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model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int1').set('argunit', {' '});
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int1').set('sourcetype', 'model');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int1').set('nargs', '2');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int1').set('struct', 'spreadsheet');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int2').set('source', 'file');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int2').label('Interpolation 2');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int2').set('importedname', 'actdep_ECDEC.txt');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int2').set('importeddim', '2D');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int2').set('funcs', {'actdep_int1' '1'});
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int2').set('fununit', {' '});
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int2').set('argunit', {' '});
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int2').set('sourcetype', 'model');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int2').set('nargs', '2');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').func('int2').set('struct', 'spreadsheet');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').set('transpNum', 'transpNm_int1(c4/1[mol/m^3],T4/1[K])');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').set('INFO_PREFIX:transpNum', ['D. Stephenson, E. Hartman, J. Harb, D. Wheeler, "Modeling of Particle-Particle Interactions in Porous Cathodes for Lithium-Ion Batteries", J. Electrochem. Soc., vol. 154, p. A1146, 2007' newline ]);
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').set('fcl', 'actdep_int1(c4/1[mol/m^3],T4/1[K])');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').set('INFO_PREFIX:fcl', ['D. Stephenson, E. Hartman, J. Harb, D. Wheeler, "Modeling of Particle-Particle Interactions in Porous Cathodes for Lithium-Ion Batteries", J. Electrochem. Soc., vol. 154, p. A1146, 2007' newline ]);
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').set('c4', 'min(1500,max(c,500))');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').descr('c4', '');

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model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').set('T4',
'min(313.15,max(T,283.15));');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').descr('T4',
'');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').addInput('c
oncentration');
model.component('comp1').material('mat2').propertyGroup('SpeciesProperties').addInput('te
mperature');
model.component('comp1').material('mat2').propertyGroup('ElectrolyteSaltConcentration').la
bel('Electrolyte salt concentration');
model.component('comp1').material('mat2').propertyGroup('ElectrolyteSaltConcentration').id
entifier('cElsalt');
model.component('comp1').material('mat2').propertyGroup('ElectrolyteSaltConcentration').s
et('cElsalt', '1000[mol/m^3]');
model.component('comp1').material('mat2').propertyGroup('ElectrolyteSaltConcentration').s
et('INFO_PREFIX:cElsalt', ['D. Stephenson, E. Hartman, J. Harb, D. Wheeler, "Modeling of
Particle-Particle Interactions in Porous Cathodes for Lithium-Ion Batteries", J. Electrochem.
Soc., vol. 154, p. A1146, 2007' newline ]);
model.component('comp1').material('mat2').selection.set([2]);
model.component('comp1').material('mat1').selection.set([1 3]);

model.component('comp1').physics('cd').create('pce1', 'PorousElectrode', 2);
model.component('comp1').physics('cd').feature('pce1').selection.set([1 3]);
model.component('comp1').physics('cd').create('pot1', 'ElectricPotential', 1);
model.component('comp1').physics('cd').feature('pot1').selection.set([3]);
model.component('comp1').physics('cd').create('egnd1', 'ElectricGround', 1);
model.component('comp1').physics('cd').feature('egnd1').selection.set([9]);

model.component('comp1').material('mat1').propertyGroup.create('ElectrolyteConductivity',
'Electrolyte_conductivity');
model.component('comp1').material('mat1').propertyGroup('ElectrolyteConductivity').set('sig
mal', {'2[S/m]});

model.component('comp1').physics('cd').feature('ice1').set('mininput_concentration', 1000);
model.component('comp1').physics('cd').feature('pce1').set('mininput_concentration', 1000);
model.component('comp1').physics('cd').feature('pce1').set('eps1', 0.67);
model.component('comp1').physics('cd').feature('pce1').set('epss', 0.33);
model.component('comp1').physics('cd').feature('pce1').feature('per1').active(false);
model.component('comp1').physics('cd').feature('pce1').create('pdl1',
'PorousMatrixDoubleLayerCapacitance', 2);

model.param.set('V_max', '2.7[V]');
model.param.set('V_min', '0[V]');
model.param.set('v', '10[V/s]');

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model.param.set('tH', '(V_max-V_min)/v', [native2unicode(hex2dec({'53' '4a'}), 'unicode')
native2unicode(hex2dec({'54' '68'}), 'unicode') native2unicode(hex2dec({'67' '1f'}),
'unicode') ]);

model.component('comp1').func.create('int1', 'Interpolation');
model.component('comp1').func('int1').set('funcname', 'V_in');
model.component('comp1').func('int1').setIndex('table', 0, 0, 0);
model.component('comp1').func('int1').setIndex('table', 'V_min', 0, 1);
model.component('comp1').func('int1').setIndex('table', 'tH', 1, 0);
model.component('comp1').func('int1').setIndex('table', 'V_max', 1, 1);
model.component('comp1').func('int1').setIndex('table', 'tH', 2, 0);
model.component('comp1').func('int1').setIndex('table', 'tH*2', 2, 0);
model.component('comp1').func('int1').setIndex('table', 'tH', 3, 0);
model.component('comp1').func('int1').setIndex('table', 'tH*3', 3, 0);
model.component('comp1').func('int1').setIndex('table', 'tH', 4, 0);
model.component('comp1').func('int1').setIndex('table', 'tH*4', 4, 0);
model.component('comp1').func('int1').setIndex('table', 'V_min', 2, 1);
model.component('comp1').func('int1').setIndex('table', 'V_min', 4, 1);
model.component('comp1').func('int1').setIndex('table', 'V_max', 3, 1);
model.component('comp1').func('int1').setIndex('fununit', 'V', 0);
model.component('comp1').func('int1').setIndex('argunit', 's', 0);

model.component('comp1').physics('cd').feature('pot1').set('phisbnd', 'V_in(t));

model.param.descr('v', [native2unicode(hex2dec({'62' '6b'}), 'unicode')
native2unicode(hex2dec({'63' 'cf'}), 'unicode') native2unicode(hex2dec({'90' '1f'}), 'unicode')
native2unicode(hex2dec({'73' '87'}), 'unicode') ]);

model.component('comp1').mesh('mesh1').run;

model.study('std1').feature('time').set('tlist', 'range(0,tH/10,tH*4));

model.sol.create('sol1');
model.sol('sol1').study('std1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');

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model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'Default');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('react', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);

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model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

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model.result.dataset.create('rev1', 'Revolve2D');
model.result.dataset('rev1').set('data', 'dset1');
model.result.dataset('rev1').set('revangle', 225);
model.result.dataset('rev1').set('startangle', -90);
model.result.dataset('rev1').set('hasspacevars', true);
model.result.create('pg1', 'PlotGroup2D');
model.result('pg1').set('data', 'dset1');
model.result('pg1').setIndex('looplevel', 41, 0);
model.result('pg1').label([native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'89' 'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}),

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'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'4f'
'4d'}), 'unicode') ' (cd)']);
model.result('pg1').create('surf1', 'Surface');
model.result('pg1').feature('surf1').set('expr', {'phil'});
model.result('pg1').create('arws1', 'ArrowSurface');
model.result('pg1').feature('arws1').set('expr', {'cd.llr' 'cd.llz'});
model.result('pg1').feature('arws1').set('arrowbase', 'center');
model.result('pg1').feature('arws1').set('color', 'gray');
model.result.create('pg2', 'PlotGroup3D');
model.result('pg2').set('data', 'rev1');
model.result('pg2').setIndex('looplevel', 41, 0);
model.result('pg2').label([native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'89' 'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}),
'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'4f'
'4d'}), 'unicode') ' , 3D (cd)']);
model.result('pg2').create('mslc1', 'Multislice');
model.result('pg2').feature('mslc1').set('expr', {'phil'});
model.result('pg2').create('arwv1', 'ArrowVolume');
model.result('pg2').feature('arwv1').set('revcoordsys', 'cylindrical');
model.result('pg2').feature('arwv1').set('expr', {'cd.llr' 'cd.llphi' 'cd.llz'});
model.result('pg2').feature('arwv1').set('arrowbase', 'center');
model.result('pg2').feature('arwv1').set('color', 'gray');
model.result.create('pg3', 'PlotGroup2D');
model.result('pg3').set('data', 'dset1');
model.result('pg3').setIndex('looplevel', 41, 0);
model.result('pg3').label([native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'89' 'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}),
'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'6d'
'41'}), 'unicode') native2unicode(hex2dec({'5b' 'c6'}), 'unicode')
native2unicode(hex2dec({'5e' 'a6'}), 'unicode') ' (cd)']);
model.result('pg3').create('arws1', 'ArrowSurface');
model.result('pg3').feature('arws1').set('expr', {'cd.llr' 'cd.llz'});
model.result('pg3').feature('arws1').set('arrowbase', 'center');
model.result('pg3').feature('arws1').set('color', 'gray');
model.result('pg3').feature('arws1').create('col1', 'Color');
model.result('pg3').feature('arws1').feature('col1').set('expr', 'root.comp1.cd.llMag');
model.result.create('pg4', 'PlotGroup3D');
model.result('pg4').set('data', 'rev1');
model.result('pg4').setIndex('looplevel', 41, 0);
model.result('pg4').label([native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'89' 'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}),
'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'6d'
'41'}), 'unicode') native2unicode(hex2dec({'5b' 'c6'}), 'unicode')
native2unicode(hex2dec({'5e' 'a6'}), 'unicode') ' , 3D (cd)']);

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model.result('pg4').create('arwv1', 'ArrowVolume');
model.result('pg4').feature('arwv1').set('revcoordsys', 'cylindrical');
model.result('pg4').feature('arwv1').set('expr', {'cd.llr' 'cd.llphi' 'cd.llz'});
model.result('pg4').feature('arwv1').set('arrowbase', 'center');
model.result('pg4').feature('arwv1').set('color', 'gray');
model.result('pg4').feature('arwv1').create('col1', 'Color');
model.result('pg4').feature('arwv1').feature('col1').set('expr', 'root.comp1.cd.lIMag');
model.result.create('pg5', 'PlotGroup2D');
model.result('pg5').set('data', 'dset1');
model.result('pg5').setIndex('looplevel', 41, 0);
model.result('pg5').label([native2unicode(hex2dec({'5b' 'f9'}), 'unicode')
native2unicode(hex2dec({'57' '30'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'67' '81'}), 'unicode') native2unicode(hex2dec({'75'
'35'}), 'unicode') native2unicode(hex2dec({'4f' '4d'}), 'unicode') ' (cd)']);
model.result.create('pg6', 'PlotGroup3D');
model.result('pg6').set('data', 'rev1');
model.result('pg6').setIndex('looplevel', 41, 0);
model.result('pg6').label([native2unicode(hex2dec({'5b' 'f9'}), 'unicode')
native2unicode(hex2dec({'57' '30'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'67' '81'}), 'unicode') native2unicode(hex2dec({'75'
'35'}), 'unicode') native2unicode(hex2dec({'4f' '4d'}), 'unicode') ' , 3D (cd)']);
model.result('pg5').create('surf1', 'Surface');
model.result('pg5').feature('surf1').set('expr', {'phis'});
model.result('pg5').create('arws1', 'ArrowSurface');
model.result('pg5').feature('arws1').set('expr', {'cd.lsr' 'cd.lsz'});
model.result('pg5').feature('arws1').set('arrowbase', 'center');
model.result('pg5').feature('arws1').set('color', 'gray');
model.result('pg6').create('mslc1', 'Multislice');
model.result('pg6').feature('mslc1').set('expr', {'phis'});
model.result('pg6').create('arwv1', 'ArrowVolume');
model.result('pg6').feature('arwv1').set('revcoordsys', 'cylindrical');
model.result('pg6').feature('arwv1').set('expr', {'cd.lsr' 'cd.lsphi' 'cd.lsz'});
model.result('pg6').feature('arwv1').set('arrowbase', 'center');
model.result('pg6').feature('arwv1').set('color', 'gray');
model.result.create('pg7', 'PlotGroup2D');
model.result('pg7').set('data', 'dset1');
model.result('pg7').setIndex('looplevel', 41, 0);
model.result('pg7').label([native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'67' '81'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'6d' '41'}), 'unicode') native2unicode(hex2dec({'5b'
'c6'}), 'unicode') native2unicode(hex2dec({'5e' 'a6'}), 'unicode') ' (cd)']);
model.result('pg7').create('arws1', 'ArrowSurface');
model.result('pg7').feature('arws1').set('expr', {'cd.lsr' 'cd.lsz'});
model.result('pg7').feature('arws1').set('arrowbase', 'center');

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```

model.result('pg7').feature('arws1').set('color', 'gray');
model.result('pg7').feature('arws1').create('col1', 'Color');
model.result('pg7').feature('arws1').feature('col1').set('expr', 'root.comp1.cd.lsMag');
model.result.create('pg8', 'PlotGroup3D');
model.result('pg8').set('data', 'rev1');
model.result('pg8').setIndex('looplevel', 41, 0);
model.result('pg8').label([native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'67' '81'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'6d' '41'}), 'unicode') native2unicode(hex2dec({'5b'
'c6'}), 'unicode') native2unicode(hex2dec({'5e' 'a6'}), 'unicode') ' ', 3D (cd)]];
model.result('pg8').create('arwv1', 'ArrowVolume');
model.result('pg8').feature('arwv1').set('revcoordsys', 'cylindrical');
model.result('pg8').feature('arwv1').set('expr', {'cd.lsr' 'cd.lsphi' 'cd.lsz'});
model.result('pg8').feature('arwv1').set('arrowbase', 'center');
model.result('pg8').feature('arwv1').set('color', 'gray');
model.result('pg8').feature('arwv1').create('col1', 'Color');
model.result('pg8').feature('arwv1').feature('col1').set('expr', 'root.comp1.cd.lsMag');
model.result('pg1').run;
model.result.create('pg9', 'PlotGroup1D');
model.result('pg9').run;
model.result('pg9').create('ptgr1', 'PointGraph');
model.result('pg9').feature('ptgr1').set('markerpos', 'datapoints');
model.result('pg9').feature('ptgr1').set('linewidth', 'preference');
model.result('pg9').feature('ptgr1').selection.set([4]);
model.result('pg9').feature('ptgr1').set('expr', 'phis');
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').feature('ptgr1').set('xdata', 'expr');
model.result('pg9').feature('ptgr1').set('xdataexpr', 'cd.itot');
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').set('switchxy', true);
model.result('pg9').run;
model.result('pg9').run;

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');

```

```

model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg2').run;
model.result('pg3').run;
model.result('pg5').run;

```

```

model.result('pg4').run;
model.result('pg6').run;
model.result('pg7').run;
model.result('pg8').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;

```

```

model.label(['[LBL' native2unicode(hex2dec({'53' '47'}), 'unicode')
native2unicode(hex2dec({'7e' 'a7'}), 'unicode') ']'B' native2unicode(hex2dec({'7a' 'd9'}),
'unicode') '-' native2unicode(hex2dec({'8d' '85'}), 'unicode') native2unicode(hex2dec({'7e'
'a7'}), 'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'5b' 'b9'}), 'unicode') native2unicode(hex2dec({'56' '68'}),
'unicode') native2unicode(hex2dec({'76' '84'}), 'unicode') native2unicode(hex2dec({'5f'
'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
native2unicode(hex2dec({'4f' '0f'}), 'unicode') native2unicode(hex2dec({'5b' '89'}),
'unicode') native2unicode(hex2dec({'6c' 'd5'}), 'unicode') '--' native2unicode(hex2dec({'60'
'52'}), 'unicode') native2unicode(hex2dec({'53' '8b'}), 'unicode')
native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
'--CV' native2unicode(hex2dec({'66' 'f2'}), 'unicode') native2unicode(hex2dec({'7e' 'bf'}),
'unicode') ' - ' native2unicode(hex2dec({'52' '6f'}), 'unicode') native2unicode(hex2dec({'67'
'2c'}), 'unicode') '.mph']);

```

```

model.result('pg9').run;

```

```

model.component('comp1').geom('geom1').run('r1');
model.component('comp1').geom('geom1').run('r2');
model.component('comp1').geom('geom1').run('r3');

```

```

model.component('comp1').physics('cd').feature('egnd1').selection.set([3]);
model.component('comp1').physics('cd').feature('pot1').selection.set([9]);

```

```

model.component('comp1').geom('geom1').feature.duplicate('r4', 'r3');
model.component('comp1').geom('geom1').feature('r4').set('pos', [5 0]);
model.component('comp1').geom('geom1').run('r4');
model.component('comp1').geom('geom1').feature.duplicate('r5', 'r4');
model.component('comp1').geom('geom1').feature.duplicate('r6', 'r5');
model.component('comp1').geom('geom1').feature.duplicate('r7', 'r5');
model.component('comp1').geom('geom1').feature.duplicate('r8', 'r5');
model.component('comp1').geom('geom1').feature.duplicate('r9', 'r5');
model.component('comp1').geom('geom1').feature.duplicate('r10', 'r8');
model.component('comp1').geom('geom1').feature.duplicate('r11', 'r10');
model.component('comp1').geom('geom1').feature.duplicate('r12', 'r10');
model.component('comp1').geom('geom1').run('r2');

```

```

model.component('comp1').geom('geom1').run('r2');
model.component('comp1').geom('geom1').feature('r2').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 2-'
native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'89' 'e3'}),
'unicode') native2unicode(hex2dec({'8d' '28'}), 'unicode') ]]);
model.component('comp1').geom('geom1').run('r2');
model.component('comp1').geom('geom1').run('r3');
model.component('comp1').geom('geom1').feature('r3').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 3 ZMO']]);
model.component('comp1').geom('geom1').feature('r4').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 4'
native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]]);
model.component('comp1').geom('geom1').feature('r6').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 6'
native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]]);
model.component('comp1').geom('geom1').feature('r8').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 8'
native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]]);
model.component('comp1').geom('geom1').feature('r10').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 10'
native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]]);
model.component('comp1').geom('geom1').feature('r12').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 12'
native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]]);
model.component('comp1').geom('geom1').feature('r5').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 5ZMO']]);
model.component('comp1').geom('geom1').feature('r7').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 7ZMO']]);
model.component('comp1').geom('geom1').feature('r9').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 9ZMO']]);
model.component('comp1').geom('geom1').feature('r11').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 11ZMO']]);
model.component('comp1').geom('geom1').feature.move('r4', 2);
model.component('comp1').geom('geom1').feature.move('r4', 3);
model.component('comp1').geom('geom1').feature('r4').set('size', [0.1 10]);
model.component('comp1').geom('geom1').feature('r3').set('size', [0.5 10]);
model.component('comp1').geom('geom1').feature('r4').set('size', [0.01 10]);
model.component('comp1').geom('geom1').feature('r5').set('size', [0.5 10]);
model.component('comp1').geom('geom1').feature('r6').set('size', [0.01 10]);

```

```

model.component('comp1').geom('geom1').feature('r7').set('size', [0.5 10]);
model.component('comp1').geom('geom1').feature('r8').set('size', [0.01 10]);
model.component('comp1').geom('geom1').feature('r9').set('size', [0.5 10]);
model.component('comp1').geom('geom1').feature('r10').set('size', [0.01 10]);
model.component('comp1').geom('geom1').feature('r11').set('size', [0.5 10]);
model.component('comp1').geom('geom1').feature('r12').set('size', [0.01 10]);
model.component('comp1').geom('geom1').feature('r4').set('pos', [3.5 0]);
model.component('comp1').geom('geom1').feature('r5').set('pos', [3.51 0]);
model.component('comp1').geom('geom1').run('r5');
model.component('comp1').geom('geom1').feature('r6').set('pos', [4.01 0]);
model.component('comp1').geom('geom1').run('r6');
model.component('comp1').geom('geom1').feature('r7').set('pos', [4.02 0]);
model.component('comp1').geom('geom1').run('r7');
model.component('comp1').geom('geom1').feature('r8').set('pos', [4.52 0]);
model.component('comp1').geom('geom1').run('r8');
model.component('comp1').geom('geom1').feature('r9').set('pos', [4.53 0]);
model.component('comp1').geom('geom1').run('r9');
model.component('comp1').geom('geom1').feature('r10').set('pos', [5.03 0]);
model.component('comp1').geom('geom1').run('r10');
model.component('comp1').geom('geom1').feature('r11').set('pos', [5.04 0]);
model.component('comp1').geom('geom1').run('r11');
model.component('comp1').geom('geom1').feature('r12').set('pos', [5.54 0]);
model.component('comp1').geom('geom1').run('r12');
model.component('comp1').geom('geom1').run('r12');
model.component('comp1').geom('geom1').run('fin');

```

```

model.component('comp1').material('mat1').selection.set([1]);

```

```

model.label(['[LBL' native2unicode(hex2dec({'53' '47'}), 'unicode')
native2unicode(hex2dec({'7e' 'a7'}), 'unicode') 'JB' native2unicode(hex2dec({'7a' 'd9'}),
'unicode') '-' native2unicode(hex2dec({'8d' '85'}), 'unicode') native2unicode(hex2dec({'7e'
'a7'}), 'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'5b' 'b9'}), 'unicode') native2unicode(hex2dec({'56' '68'}),
'unicode') native2unicode(hex2dec({'76' '84'}), 'unicode') native2unicode(hex2dec({'5f'
'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
native2unicode(hex2dec({'4f' '0f'}), 'unicode') native2unicode(hex2dec({'5b' '89'}),
'unicode') native2unicode(hex2dec({'6c' 'd5'}), 'unicode') '--' native2unicode(hex2dec({'60'
'52'}), 'unicode') native2unicode(hex2dec({'53' '8b'}), 'unicode')
native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
'--CV' native2unicode(hex2dec({'66' 'f2'}), 'unicode') native2unicode(hex2dec({'7e' 'bf'}),
'unicode') ' - ' native2unicode(hex2dec({'52' '6f'}), 'unicode') native2unicode(hex2dec({'67'
'2c'}), 'unicode') '.mph']);

```

```

model.component('comp1').geom('geom1').run('r4');

```



```

model.component('comp1').geom('geom1').run('r1');
model.component('comp1').geom('geom1').run('r2');
model.component('comp1').geom('geom1').feature('r1').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 1'
native2unicode(hex2dec({'6d' '3b'}), 'unicode') native2unicode(hex2dec({'60' '27'}),
'unicode') native2unicode(hex2dec({'70' 'ad'}), 'unicode') ]]);
model.component('comp1').geom('geom1').run('r1');

model.component('comp1').material.create('mat3', 'Common');
model.component('comp1').material('mat3').propertyGroup.create('ElectrodePotential',
'Equilibrium potential');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').func.create(
'int1', 'Interpolation');
model.component('comp1').material('mat3').propertyGroup.create('OperationalSOC',
'Operational electrode state of charge');
model.component('comp1').material('mat3').propertyGroup.create('EquilibriumConcentratio
n', 'Equilibrium concentration');
model.component('comp1').material('mat3').label('Hard Carbon (Negative, Li-ion Battery)');
model.component('comp1').material('mat3').comments(['vs Li/Li+, T=25 C' newline 'Eeq for
fully lithiated at 0.79' newline 'Eeq for delithiated at 0.02' newline  newline 'Reference'
newline 'D. P. Karthikeyan, G. Sikha, and R. E. White, ' native2unicode(hex2dec({'20' '1c'}),
'unicode') 'Thermodynamic model development for lithium intercalation electrodes,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Power Sources, vol. 185, p. 1398, 2008.'
newline ]]);
model.component('comp1').material('mat3').propertyGroup('def').label('Basic');
model.component('comp1').material('mat3').propertyGroup('def').set('diffusion', {'3.9e-
14[m^2/s]' '0' '0' '0' '3.9e-14[m^2/s]' '0' '0' '0' '3.9e-14[m^2/s]'});
model.component('comp1').material('mat3').propertyGroup('def').set('electricconductivity',
{'100[S/m]' '0' '0' '0' '100[S/m]' '0' '0' '0' '100[S/m]'});
model.component('comp1').material('mat3').propertyGroup('def').set('density',
'2260[kg/m^3]');
model.component('comp1').material('mat3').propertyGroup('def').set('csmx',
'30550[mol/m^3]');
model.component('comp1').material('mat3').propertyGroup('def').descr('csmx', '');
model.component('comp1').material('mat3').propertyGroup('def').addInput('concentration');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').label('Equili
brium potential');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').func('int1').l
abel('Interpolation 1');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').func('int1').
set('funcname', 'Eeq_int1');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').func('int1').
set('table', {'0.0210' '0.7144'; ...
'0.0356' '0.6297'; ...

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'0.0501' '0.5851'; ...
'0.0703' '0.5540'; ...
'0.0935' '0.5228'; ...
'0.1050' '0.5051'; ...
'0.1223' '0.4873'; ...
'0.1368' '0.4650'; ...
'0.1541' '0.4518'; ...
'0.1714' '0.4295'; ...
'0.1887' '0.4162'; ...
'0.2032' '0.3940'; ...
'0.2176' '0.3761'; ...
'0.2349' '0.3585'; ...
'0.2522' '0.3452'; ...
'0.2811' '0.3096'; ...
'0.2984' '0.2963'; ...
'0.3129' '0.2785'; ...
'0.3302' '0.2608'; ...
'0.3446' '0.2475'; ...
'0.3648' '0.2342'; ...
'0.3792' '0.2209'; ...
'0.3965' '0.2076'; ...
'0.4110' '0.1943'; ...
'0.4283' '0.1810'; ...
'0.4426' '0.1676'; ...
'0.4571' '0.1588'; ...
'0.4773' '0.1500'; ...
'0.4917' '0.1367'; ...
'0.5119' '0.1279'; ...
'0.5263' '0.1190'; ...
'0.5407' '0.1102'; ...
'0.5580' '0.0969'; ...
'0.5753' '0.0880'; ...
'0.5897' '0.0836'; ...
'0.6040' '0.0748'; ...
'0.6214' '0.0660'; ...
'0.6358' '0.0616'; ...
'0.6531' '0.0572'; ...
'0.6703' '0.0528'; ...
'0.6848' '0.0485'; ...
'0.7020' '0.0484'; ...
'0.7193' '0.0442'; ...
'0.7337' '0.0398'; ...
'0.7510' '0.0397'; ...
'0.7682' '0.0355'; ...

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'0.7826' '0.0318'; ...
'0.7913' '0.0310'});
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').func('int1').
set('interp', 'piecewisecubic');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').func('int1').
set('extrap', 'linear');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').func('int1').
set('fununit', {'V'});
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').func('int1').
set('argunit', {'1'});
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').func('int1').
set('defineinv', true);
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').func('int1').
set('funcinvname', 'Eeq_inv');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').set('Eeq',
'Eeq_int1(soc)');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').set('INFO_P
REFIX:Eeq', ['D. P Karthikeyan, G. Sikha, and R. E. White, ' native2unicode(hex2dec({'20' '1c'}),
'unicode') 'Thermodynamic model development for lithium intercalation electrodes,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Power Sources, vol. 185, p. 1398, 2008.']);
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').set('dEeqdT
', '0[V/K]');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').set('cEeqref
', 'def.csmax');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').set('soc',
'c/cEeqref');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').descr('soc',
'');
model.component('comp1').material('mat3').propertyGroup('ElectrodePotential').addInput('c
oncentration');
model.component('comp1').material('mat3').propertyGroup('OperationalSOC').label('Operati
onal electrode state of charge');
model.component('comp1').material('mat3').propertyGroup('OperationalSOC').set('socmax',
'elpot.Eeq_inv(E_min)');
model.component('comp1').material('mat3').propertyGroup('OperationalSOC').set('socmin',
'elpot.Eeq_inv(E_max)');
model.component('comp1').material('mat3').propertyGroup('OperationalSOC').set('E_max',
'0.7[V]');
model.component('comp1').material('mat3').propertyGroup('OperationalSOC').set('E_min',
'0.05[V]');
model.component('comp1').material('mat3').propertyGroup('EquilibriumConcentration').labe
l('Equilibrium concentration');
model.component('comp1').material('mat3').propertyGroup('EquilibriumConcentration').set('
csEq', 'def.csmax*elpot.Eeq_inv(V)');

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model.component('comp1').material('mat3').propertyGroup('EquilibriumConcentration').addInput('electricpotential');
model.component('comp1').material('mat3').selection.set([1]);
model.component('comp1').material('mat3').label([native2unicode(hex2dec({'8d' '1f'}), 'unicode') native2unicode(hex2dec({'67' '81'}), 'unicode') 'Hard Carbon (Negative, Li-ion Battery)']);
model.component('comp1').material('mat3').propertyGroup.create('ElectrolyteConductivity', 'Electrolyte_conductivity');
model.component('comp1').material('mat3').propertyGroup('ElectrolyteConductivity').set('sigma', {'32.4'});
model.material.create('mat4', 'Common', '');
model.material('mat4').propertyGroup.create('ElectrodePotential', 'Equilibrium potential');
model.material('mat4').propertyGroup('ElectrodePotential').func.create('int1', 'Interpolation');
model.material('mat4').propertyGroup('ElectrodePotential').func.create('int2', 'Interpolation');
model.material('mat4').propertyGroup.create('OperationalSOC', 'Operational electrode state of charge');
model.material('mat4').propertyGroup.create('EquilibriumConcentration', 'Equilibrium concentration');
model.material('mat4').propertyGroup.create('ElectrolyteConductivity', [native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'89' 'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}), 'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'5b' 'fc'}), 'unicode') native2unicode(hex2dec({'73' '87'}), 'unicode') ]);
model.material('mat4').label('ZnMnO4');
model.material('mat4').propertyGroup('def').label('Basic');
model.material('mat4').propertyGroup('def').set('youngsm modulus', '');
model.material('mat4').propertyGroup('def').set('poissons ratio', '');
model.material('mat4').propertyGroup('def').set('youngsm modulus', '194[GPa]');
model.material('mat4').propertyGroup('def').set('INFO_PREFIX:youngsm modulus', 'Yue Qi et al 2014 J. Electrochem. Soc. 161 F3010');
model.material('mat4').propertyGroup('def').set('poissons ratio', '0.26');
model.material('mat4').propertyGroup('def').set('INFO_PREFIX:poissons ratio', 'Yue Qi et al 2014 J. Electrochem. Soc. 161 F3010');
model.material('mat4').propertyGroup('def').set('electricconductivity', {'3e3[S/m]' '0' '0' '0' '3e3[S/m]' '0' '0' '0' '3e3[S/m]'});
model.material('mat4').propertyGroup('def').set('INFO_PREFIX:electricconductivity', 'V. Srinivasan and C.Y. Wang, "Analysis of Electrochemical and Thermal Behavior of Li-Ion Cells," J. Electrochem. Soc., vol. 150, p. A98, 2003');
model.material('mat4').propertyGroup('def').set('diffusion', {'1e-14*exp(20000/8.314*(1/(T_ref/1[K])-1/(T2/1[K]))) [m^2/s]' '0' '0' '0' '1e-14*exp(20000/8.314*(1/(T_ref/1[K])-1/(T2/1[K]))) [m^2/s]' '0' '0' '0' '1e-14*exp(20000/8.314*(1/(T_ref/1[K])-1/(T2/1[K]))) [m^2/s]'});

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model.material('mat4').propertyGroup('def').set('INFO_PREFIX:diffusion', 'V. Srinivasan and
C.Y. Wang, "Analysis of Electrochemical and Thermal Behavior of Li-Ion Cells," J.
Electrochem. Soc., vol. 150, p. A98, 2003');
model.material('mat4').propertyGroup('def').set('density', '1950[kg/m^3]');
model.material('mat4').propertyGroup('def').set('INFO_PREFIX:density', 'N. Nitta, F. Wu, J. Tae
Lee, and G. Yushin, Materials Today, Volume 18, Number 5, June 2015');
model.material('mat4').propertyGroup('def').set('T_ref', '298[K]');
model.material('mat4').propertyGroup('def').descr('T_ref', '');
model.material('mat4').propertyGroup('def').set('T2', 'min(393.15,max(T,223.15))');
model.material('mat4').propertyGroup('def').descr('T2', '');
model.material('mat4').propertyGroup('def').set('csmax', '22860[mol/m^3]');
model.material('mat4').propertyGroup('def').descr('csmax', '');
model.material('mat4').propertyGroup('def').set('relpermeability', {'1' '0' '0' '0' '1' '0' '0' '0'
'1'});
model.material('mat4').propertyGroup('def').set('heatcapacity', '710[J/(kg*K)]');
model.material('mat4').propertyGroup('def').set('relpermittivity', {'1' '0' '0' '0' '1' '0' '0' '0' '1'});
model.material('mat4').propertyGroup('def').set('emissivity', '1');
model.material('mat4').propertyGroup('def').set('thermalconductivity',
{'150[W/(m*K)]*(300[K]/T)' '0' '0' '0' '150[W/(m*K)]*(300[K]/T)' '0' '0' '0'
'150[W/(m*K)]*(300[K]/T)'});
model.material('mat4').propertyGroup('def').addInput('temperature');
model.material('mat4').propertyGroup('ElectrodePotential').label('Equilibrium potential');
model.material('mat4').propertyGroup('ElectrodePotential').func('int1').label('Interpolation
1');
model.material('mat4').propertyGroup('ElectrodePotential').func('int1').set('funcname',
'Eeq_int1');
model.material('mat4').propertyGroup('ElectrodePotential').func('int1').set('table', {'0.1750'
'4.2763'; ...
'0.1950' '4.1898'; ...
'0.2150' '4.1507'; ...
'0.2350' '4.133'; ...
'0.2550' '4.1248'; ...
'0.2750' '4.1209'; ...
'0.2950' '4.119'; ...
'0.3150' '4.1179'; ...
'0.3350' '4.1171'; ...
'0.3550' '4.1165'; ...
'0.3750' '4.116'; ...
'0.3950' '4.1153'; ...
'0.4150' '4.1145'; ...
'0.4350' '4.1135'; ...
'0.4550' '4.1121'; ...
'0.4750' '4.1099'; ...
'0.4950' '4.1066'; ...

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'0.5150' '4.1014'; ...
'0.5350' '4.0934'; ...
'0.5550' '4.082'; ...
'0.5750' '4.067'; ...
'0.5950' '4.05'; ...
'0.6150' '4.0333'; ...
'0.6350' '4.0192'; ...
'0.6550' '4.0087'; ...
'0.6750' '4.0012'; ...
'0.6950' '3.996'; ...
'0.7150' '3.9923'; ...
'0.7350' '3.9893'; ...
'0.7550' '3.9867'; ...
'0.7750' '3.9841'; ...
'0.7950' '3.9813'; ...
'0.8150' '3.9783'; ...
'0.8350' '3.9747'; ...
'0.8550' '3.9705'; ...
'0.8750' '3.9652'; ...
'0.8950' '3.9585'; ...
'0.9150' '3.9493'; ...
'0.9350' '3.9361'; ...
'0.9550' '3.9144'; ...
'0.9750' '3.869'; ...
'0.9950' '3.5944'; ...
'' ''');
model.material('mat4').propertyGroup('ElectrodePotential').func('int1').set('interp',
'piecewisecubic');
model.material('mat4').propertyGroup('ElectrodePotential').func('int1').set('extrap', 'linear');
model.material('mat4').propertyGroup('ElectrodePotential').func('int1').set('fununit', {'V'});
model.material('mat4').propertyGroup('ElectrodePotential').func('int1').set('argunit', {''});
model.material('mat4').propertyGroup('ElectrodePotential').func('int1').set('defineinv', true);
model.material('mat4').propertyGroup('ElectrodePotential').func('int1').set('funcinvname',
'Eeq_inv');
model.material('mat4').propertyGroup('ElectrodePotential').func('int2').label('Interpolation
2');
model.material('mat4').propertyGroup('ElectrodePotential').func('int2').set('funcname',
'dEeqdT_int1');
model.material('mat4').propertyGroup('ElectrodePotential').func('int2').set('table', {'0.15'
'0.15e-3'; ...
'0.18' '0.25e-3'; ...
'0.20' '0.21e-3'; ...
'0.209' '0.19e-3'; ...
'0.26' '0.175e-3'; ...

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'0.28' '0.166e-3'; ...
'0.30' '0.155e-3'; ...
'0.35' '0.11e-3'; ...
'0.394' '0.095e-3'; ...
'0.41' '0.05e-3'; ...
'0.437' '0.02e-3'; ...
'0.445' '0'; ...
'0.46' '-0.048e-3'; ...
'0.48' '-0.15e-3'; ...
'0.50' '-0.255e-3'; ...
'0.515' '-0.3e-3'; ...
'0.545' '-0.3e-3'; ...
'0.553' '-0.22e-3'; ...
'0.58' '-0.145e-3'; ...
'0.592' '-0.10e-3'; ...
'0.60' '0'; ...
'0.62' '0.08e-3'; ...
'0.64' '0.12e-3'; ...
'0.70' '0.124e-3'; ...
'0.72' '0.10e-3'; ...
'0.73' '0.05e-3'; ...
'0.76' '0'; ...
'0.78' '-0.057e-3'; ...
'0.81' '-0.08e-3'; ...
'0.86' '-0.10e-3'; ...
'0.91' '-0.16e-3'; ...
'0.96' '-0.22e-3'; ...
'0.98' '-0.30e-3'});
model.material('mat4').propertyGroup('ElectrodePotential').func('int2').set('interp',
'piecewisecubic');
model.material('mat4').propertyGroup('ElectrodePotential').func('int2').set('fununit', {'V/K'});
model.material('mat4').propertyGroup('ElectrodePotential').func('int2').set('argunit', {''});
model.material('mat4').propertyGroup('ElectrodePotential').set('Eeq',
'Eeq_int1(soc)+dEeqdT_int1(soc)*(T-298[K])');
model.material('mat4').propertyGroup('ElectrodePotential').set('INFO_PREFIX:Eeq', 'V.
Srinivasan and C.Y. Wang, "Analysis of Electrochemical and Thermal Behavior of Li-Ion
Cells," J. Electrochem. Soc., vol. 150, p. A98, 2003');
model.material('mat4').propertyGroup('ElectrodePotential').set('dEeqdT', 'dEeqdT_int1(soc)');
model.material('mat4').propertyGroup('ElectrodePotential').set('INFO_PREFIX:dEeqdT', 'V.
Srinivasan and C.Y. Wang, "Analysis of Electrochemical and Thermal Behavior of Li-Ion
Cells," J. Electrochem. Soc., vol. 150, p. A98, 2003');
model.material('mat4').propertyGroup('ElectrodePotential').set('cEeqref', 'def.csmax');

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model.material('mat4').propertyGroup('ElectrodePotential').set('INFO_PREFIX:cEeqref', 'V.
Srinivasan and C.Y. Wang, "Analysis of Electrochemical and Thermal Behavior of Li-Ion
Cells," J. Electrochem. Soc., vol. 150, p. A98, 2003');
model.material('mat4').propertyGroup('ElectrodePotential').set('soc', 'c/cEeqref');
model.material('mat4').propertyGroup('ElectrodePotential').descr('soc', '');
model.material('mat4').propertyGroup('ElectrodePotential').addInput('concentration');
model.material('mat4').propertyGroup('ElectrodePotential').addInput('temperature');
model.material('mat4').propertyGroup('OperationalSOC').label('Operational electrode state
of charge');
model.material('mat4').propertyGroup('OperationalSOC').set('socmax',
'elpot.Eeq_inv(E_min)');
model.material('mat4').propertyGroup('OperationalSOC').set('socmin',
'elpot.Eeq_inv(E_max)');
model.material('mat4').propertyGroup('OperationalSOC').set('E_max', '4.2[V]');
model.material('mat4').propertyGroup('OperationalSOC').set('E_min', '3.9[V]');
model.material('mat4').propertyGroup('EquilibriumConcentration').label('Equilibrium
concentration');
model.material('mat4').propertyGroup('EquilibriumConcentration').set('csEq',
'def.csmax*elpot.Eeq_inv(V)');
model.material('mat4').propertyGroup('EquilibriumConcentration').addInput('electricpotentia
l');
model.material('mat4').propertyGroup('ElectrolyteConductivity').set('sigmal', {'2[S/m]' '0' '0'
'0' '2[S/m]' '0' '0' '0' '2[S/m]'});
model.material.create('mat5', 'Common', '');
model.material('mat5').propertyGroup('def').func.create('int1', 'Interpolation');
model.material('mat5').propertyGroup('def').func.create('int2', 'Interpolation');
model.material('mat5').propertyGroup.create('ElectrodePotential', 'Equilibrium potential');
model.material('mat5').propertyGroup('ElectrodePotential').func.create('int1', 'Interpolation');
model.material('mat5').propertyGroup('ElectrodePotential').func.create('int2', 'Interpolation');
model.material('mat5').propertyGroup.create('OperationalSOC', 'Operational electrode state
of charge');
model.material('mat5').propertyGroup.create('ic', 'Intercalation strain');
model.material('mat5').propertyGroup('ic').func.create('int1', 'Interpolation');
model.material('mat5').propertyGroup.create('EquilibriumConcentration', 'Equilibrium
concentration');
model.material('mat5').label('Graphite, LixC6 MCMB (Negative, Li-ion Battery) 1');
model.material('mat5').propertyGroup('def').label('Basic');
model.material('mat5').propertyGroup('def').func('int1').label('Interpolation 1');
model.material('mat5').propertyGroup('def').func('int1').set('funcname', 'E_int');
model.material('mat5').propertyGroup('def').func('int1').set('table', {'0' '32.47'; '0.333' '28.56';
'0.5' '58.06'; '1' '108.67'});
model.material('mat5').propertyGroup('def').func('int1').set('fununit', {'GPa'});
model.material('mat5').propertyGroup('def').func('int1').set('argunit', {'1'});
model.material('mat5').propertyGroup('def').func('int2').label('Interpolation 2');

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model.material('mat5').propertyGroup('def').func('int2').set('funcname', 'nu_int');
model.material('mat5').propertyGroup('def').func('int2').set('table', {'0' '0.32'; '0.333' '0.39';
'0.5' '0.34'; '1' '0.24'});
model.material('mat5').propertyGroup('def').func('int2').set('fununit', {'});
model.material('mat5').propertyGroup('def').set('youngsmodulus', '');
model.material('mat5').propertyGroup('def').set('poissonsratio', '');
model.material('mat5').propertyGroup('def').set('youngsmodulus', 'E_int(c/csmx)');
model.material('mat5').propertyGroup('def').set('INFO_PREFIX:youngsmodulus', 'Yue Qi et al
2010 J. Electrochem. Soc. 157 A558');
model.material('mat5').propertyGroup('def').set('poissonsratio', 'nu_int(c/csmx)');
model.material('mat5').propertyGroup('def').set('INFO_PREFIX:poissonsratio', 'Yue Qi et al
2010 J. Electrochem. Soc. 157 A558');
model.material('mat5').propertyGroup('def').set('electricconductivity', {'100[S/m]' '0' '0' '0'
'100[S/m]' '0' '0' '0' '100[S/m]'});
model.material('mat5').propertyGroup('def').set('INFO_PREFIX:electricconductivity', ['V.
Srinivasan, and J. Newman, ' native2unicode(hex2dec({'20' '1c'}), 'unicode') 'Design and
Optimization of a Natural Graphite/Iron Phosphate Lithium Ion Cell,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Electrochem. Soc., vol. 151, p. 1530,
2004.']);
model.material('mat5').propertyGroup('def').set('diffusion', {'1.4523e-
13*exp(68025.7/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]' '0' '0' '0' '1.4523e-
13*exp(68025.7/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]' '0' '0' '0' '1.4523e-
13*exp(68025.7/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]'});
model.material('mat5').propertyGroup('def').set('INFO_PREFIX:diffusion', ['K. Kumaresan, G.
Sikha, and R. E. White, ' native2unicode(hex2dec({'20' '1c'}), 'unicode') 'Thermal Model for a
Li-Ion Cell,' native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Electrochem. Soc., vol. 155, p.
A164, 2008.']);
model.material('mat5').propertyGroup('def').set('thermalconductivity', {'1[W/(m*K)]' '0' '0' '0'
'1[W/(m*K)]' '0' '0' '0' '1[W/(m*K)]'});
model.material('mat5').propertyGroup('def').set('INFO_PREFIX:thermalconductivity', 'S. Chen,
C. Wan, and Y. Wang, J. Power Sources, 140, 111 (2005).');
model.material('mat5').propertyGroup('def').set('heatcapacity', '750[J/(kg*K)]');
model.material('mat5').propertyGroup('def').set('INFO_PREFIX:heatcapacity', 'SI Chemical
Data, John Wiley & Sons, 1994');
model.material('mat5').propertyGroup('def').set('density', '2300[kg/m^3]');
model.material('mat5').propertyGroup('def').set('INFO_PREFIX:density', 'SI Chemical Data,
John Wiley & Sons, 1994');
model.material('mat5').propertyGroup('def').set('csmx', '31507[mol/m^3]');
model.material('mat5').propertyGroup('def').descr('csmx', '');
model.material('mat5').propertyGroup('def').set('T_ref', '318[K]');
model.material('mat5').propertyGroup('def').descr('T_ref', '');
model.material('mat5').propertyGroup('def').set('T2', 'min(393.15,max(T,223.15))');
model.material('mat5').propertyGroup('def').descr('T2', '');
model.material('mat5').propertyGroup('def').addInput('temperature');

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model.material('mat5').propertyGroup('def').addInput('concentration');
model.material('mat5').propertyGroup('ElectrodePotential').label('Equilibrium potential');
model.material('mat5').propertyGroup('ElectrodePotential').func('int1').label('Interpolation
1');
model.material('mat5').propertyGroup('ElectrodePotential').func('int1').set('funcname',
'Eeq_int1');
model.material('mat5').propertyGroup('ElectrodePotential').func('int1').set('table', {'0'
'2.781186612'; ...
'0.01' '1.520893224'; ...
'0.02' '0.893922607'; ...
'0.03' '0.581284406'; ...
'0.04' '0.42452844'; ...
'0.05' '0.344895805'; ...
'0.06' '0.303146342'; ...
'0.07' '0.279578072'; ...
'0.08' '0.264093089'; ...
'0.09' '0.251347845'; ...
'0.1' '0.238588379'; ...
'0.11' '0.224803164'; ...
'0.12' '0.210294358'; ...
'0.13' '0.196408586'; ...
'0.14' '0.184624188'; ...
'0.15' '0.175188157'; ...
'0.16' '0.167373311'; ...
'0.17' '0.160452107'; ...
'0.18' '0.154025412'; ...
'0.19' '0.147948522'; ...
'0.2' '0.142214997'; ...
'0.21' '0.13688271'; ...
'0.22' '0.132033114'; ...
'0.23' '0.127747573'; ...
'0.24' '0.124091616'; ...
'0.25' '0.121103387'; ...
'0.26' '0.11878567'; ...
'0.27' '0.117102317'; ...
'0.28' '0.115980205'; ...
'0.29' '0.115317054'; ...
'0.3' '0.114993965'; ...
'0.31' '0.114890105'; ...
'0.32' '0.114886278'; ...
'0.33' '0.114884619'; ...
'0.34' '0.114873068'; ...
'0.35' '0.114824904'; ...
'0.36' '0.114644725'; ...

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'0.37' '0.114372614'; ...
'0.38' '0.114017954'; ...
'0.39' '0.11359371'; ...
'0.4' '0.11311133'; ...
'0.41' '0.112575849'; ...
'0.42' '0.111980245'; ...
'0.43' '0.111297682'; ...
'0.44' '0.110470149'; ...
'0.45' '0.109393081'; ...
'0.46' '0.107900592'; ...
'0.47' '0.10576964'; ...
'0.48' '0.102783317'; ...
'0.49' '0.09889031'; ...
'0.5' '0.094391564'; ...
'0.51' '0.089921069'; ...
'0.52' '0.086112415'; ...
'0.53' '0.083265315'; ...
'0.54' '0.081326247'; ...
'0.55' '0.080074892'; ...
'0.56' '0.07928329'; ...
'0.57' '0.078778765'; ...
'0.58' '0.078447703'; ...
'0.59' '0.078220432'; ...
'0.6' '0.078055641'; ...
'0.61' '0.077929111'; ...
'0.62' '0.077826563'; ...
'0.63' '0.077739397'; ...
'0.64' '0.077662227'; ...
'0.65' '0.077591472'; ...
'0.66' '0.077524557'; ...
'0.67' '0.077459463'; ...
'0.68' '0.077394455'; ...
'0.69' '0.077327934'; ...
'0.7' '0.077258337'; ...
'0.71' '0.077184077'; ...
'0.72' '0.077103499'; ...
'0.73' '0.077014851'; ...
'0.74' '0.076916258'; ...
'0.75' '0.07680571'; ...
'0.76' '0.07668104'; ...
'0.77' '0.07653992'; ...
'0.78' '0.076379839'; ...
'0.79' '0.076198086'; ...
'0.8' '0.075991699'; ...

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'0.81' '0.075757371'; ...
'0.82' '0.075491288'; ...
'0.83' '0.075188813'; ...
'0.84' '0.07484398'; ...
'0.85' '0.074448647'; ...
'0.86' '0.07399118'; ...
'0.87' '0.073454466'; ...
'0.88' '0.072812991'; ...
'0.89' '0.072028722'; ...
'0.9' '0.071045433'; ...
'0.91' '0.069780996'; ...
'0.92' '0.068116222'; ...
'0.93' '0.065874599'; ...
'0.94' '0.062770873'; ...
'0.95' '0.058253898'; ...
'0.96' '0.051075794'; ...
'0.97' '0.038790069'; ...
'0.98' '0.020172191'}});
model.material('mat5').propertyGroup('ElectrodePotential').func('int1').set('interp',
'piecewisecubic');
model.material('mat5').propertyGroup('ElectrodePotential').func('int1').set('extrap', 'linear');
model.material('mat5').propertyGroup('ElectrodePotential').func('int1').set('fununit', {'V'});
model.material('mat5').propertyGroup('ElectrodePotential').func('int1').set('argunit', {''});
model.material('mat5').propertyGroup('ElectrodePotential').func('int1').set('defineinv', true);
model.material('mat5').propertyGroup('ElectrodePotential').func('int1').set('funcinvname',
'Eeq_inv');
model.material('mat5').propertyGroup('ElectrodePotential').func('int2').label('Interpolation
2');
model.material('mat5').propertyGroup('ElectrodePotential').func('int2').set('funcname',
'dEeqdT_int1');
model.material('mat5').propertyGroup('ElectrodePotential').func('int2').set('table', {'0' '3.0e-
4'; ...
'0.17' '0'; ...
'0.24' '-6e-5'; ...
'0.28' '-1.6e-4'; ...
'0.5' '-1.6e-4'; ...
'0.54' '-9e-5'; ...
'0.71' '-9e-5'; ...
'0.85' '-1.0e-4'; ...
'1.0' '-1.2e-4'});
model.material('mat5').propertyGroup('ElectrodePotential').func('int2').set('fununit', {'V/K'});
model.material('mat5').propertyGroup('ElectrodePotential').func('int2').set('argunit', {''});
model.material('mat5').propertyGroup('ElectrodePotential').set('Eeq',
'Eeq_int1(soc)+dEeqdT_int1(soc)*(T-298[K])');

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model.material('mat5').propertyGroup('ElectrodePotential').set('INFO_PREFIX:Eeq', ['D. P
Karthikeyan, G. Sikha, and R. E. White, ' native2unicode(hex2dec({'20' '1c'}), 'unicode')
'Thermodynamic model development for lithium intercalation electrodes,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Power Sources, vol. 185, p. 1398, 2008.']);
model.material('mat5').propertyGroup('ElectrodePotential').set('dEeqdT', 'dEeqdT_int1(soc)');
model.material('mat5').propertyGroup('ElectrodePotential').set('INFO_PREFIX:dEeqdT', ['K. E.
Thomas, and J. Newman, ' native2unicode(hex2dec({'20' '1c'}), 'unicode') 'Heats of mixing
and of entropy in porous insertion electrodes,' native2unicode(hex2dec({'20' '1d'}),
'unicode') ' J. Power Sources., vol. 119-121, p. 844, 2003.']);
model.material('mat5').propertyGroup('ElectrodePotential').set('cEeqref', 'def.csmax');
model.material('mat5').propertyGroup('ElectrodePotential').set('soc', 'c/cEeqref');
model.material('mat5').propertyGroup('ElectrodePotential').descr('soc', '');
model.material('mat5').propertyGroup('ElectrodePotential').addInput('concentration');
model.material('mat5').propertyGroup('ElectrodePotential').addInput('temperature');
model.material('mat5').propertyGroup('OperationalSOC').label('Operational electrode state
of charge');
model.material('mat5').propertyGroup('OperationalSOC').set('socmax',
'elpot.Eeq_inv(E_min)');
model.material('mat5').propertyGroup('OperationalSOC').set('socmin',
'elpot.Eeq_inv(E_max)');
model.material('mat5').propertyGroup('OperationalSOC').set('E_max', '1[V]');
model.material('mat5').propertyGroup('OperationalSOC').set('E_min', '0.075[V]');
model.material('mat5').propertyGroup('ic').label('Intercalation strain');
model.material('mat5').propertyGroup('ic').func('int1').label('Interpolation 1');
model.material('mat5').propertyGroup('ic').func('int1').set('funcname', 'dVOLdSOL');
model.material('mat5').propertyGroup('ic').func('int1').set('table', {'0' '0'; ...
'0.006802721088435382' '0.12500000000000178'; ...
'0.06316812439261421' '1.2736486486486491'; ...
'0.11175898931000966' '2.523648648648649'; ...
'0.17978620019436342' '3.5709459459459474'; ...
'0.2400388726919339' '4.449324324324325'; ...
'0.2905733722060252' '5.192567567567568'; ...
'0.3566569484936831' '5.66554054054054'; ...
'0.4188532555879494' '5.969594594594595'; ...
'0.48104956268221566' '6.10472972972973'; ...
'0.5432458697764819' '6.173648648648647'; ...
'0.58600583090379' '6.306081081081081'; ...
'0.6112730806608356' '7.726351351351352'; ...
'0.6443148688046647' '8.570945945945946'; ...
'0.694849368318756' '9.449324324324323'; ...
'0.7414965986394557' '10.29391891891892'; ...
'0.7764820213799805' '10.902027027027025'; ...
'0.8231292517006802' '11.543918918918918'; ...
'0.8542274052478133' '12.152027027027026'; ...

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'0.8833819241982507' '12.827702702702702'; ...
'0.9183673469387755' '12.996621621621621'; ...
'0.9494655004859086' '13.16554054054054'}});
model.material('mat5').propertyGroup('ic').func('int1').set('extrap', 'linear');
model.material('mat5').propertyGroup('ic').func('int1').set('fununit', {'%'});
model.material('mat5').propertyGroup('ic').func('int1').set('argunit', {'1'});
model.material('mat5').propertyGroup('ic').set('dvol', 'dVOLdSOL(c/def.csmax)');
model.material('mat5').propertyGroup('ic').set('INFO_PREFIX:dvol', ['S. Schweidler, L. de Biasi,
A. Schiele, P. Hartmann, T. Brezesinski and J. Janek, "Volume Changes of Graphite Anodes
Revisited: A Combined Operando X-Ray Diffraction and In Situ Pressure Analysis Study", J.
Phys. Chem. C, 2018, 122, 8829' native2unicode(hex2dec({'20' '13'}), 'unicode') '8835']);
model.material('mat5').propertyGroup('ic').addInput('concentration');
model.material('mat5').propertyGroup('EquilibriumConcentration').label('Equilibrium
concentration');
model.material('mat5').propertyGroup('EquilibriumConcentration').set('csEq',
'def.csmax*elpot.Eeq_inv(V)');
model.material('mat5').propertyGroup('EquilibriumConcentration').addInput('electricpotentia
l');
model.component('comp1').material.create('mat6', 'Common');
model.component('comp1').material('mat6').propertyGroup('def').func.create('int1',
'Interpolation');
model.component('comp1').material('mat6').propertyGroup('def').func.create('int2',
'Interpolation');
model.component('comp1').material('mat6').propertyGroup('def').func.create('int3',
'Interpolation');
model.component('comp1').material('mat6').propertyGroup.create('ElectrolyteConductivity',
'Electrolyte conductivity');
model.component('comp1').material('mat6').propertyGroup.create('SpeciesProperties',
'Species properties');
model.component('comp1').material('mat6').label('KOH (Liquid)');
model.component('comp1').material('mat6').comments([ newline ]);
model.component('comp1').material('mat6').propertyGroup('def').label('Basic');
model.component('comp1').material('mat6').propertyGroup('def').func('int1').label('Interpolat
ion 1');
model.component('comp1').material('mat6').propertyGroup('def').func('int1').set('funcname',
'A_rho');
model.component('comp1').material('mat6').propertyGroup('def').func('int1').set('table', {'0'
'-0.5031'; ...
'5' '-0.4821'; ...
'10' '-0.5026'; ...
'15' '-0.482'; ...
'20' '-0.4824'; ...
'25' '-0.4931'; ...
'30' '-0.4812'; ...

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'35' '-0.4918'; ...
'40' '-0.4863'; ...
'45' '-0.4912'; ...
'50' '-0.4756'; ...
'55' '-0.4898'; ...
'60' '-0.4916'; ...
'65' '-0.4906'; ...
'70' '-0.4876'; ...
'80' '-0.4942'; ...
'90' '-0.5021'; ...
'100' '-0.501'; ...
'150' '-0.5206'; ...
'200' '-0.5538'});
model.component('comp1').material('mat6').propertyGroup('def').func('int1').set('fununit',
{'1'});
model.component('comp1').material('mat6').propertyGroup('def').func('int1').set('argunit',
{'1'});
model.component('comp1').material('mat6').propertyGroup('def').func('int2').label('Interpolat
ion 2');
model.component('comp1').material('mat6').propertyGroup('def').func('int2').set('funcname',
'B_rho');
model.component('comp1').material('mat6').propertyGroup('def').func('int2').set('table', {'0'
'45.876'; ...
'5' '45.648'; ...
'10' '45.889'; ...
'15' '45.659'; ...
'20' '45.649'; ...
'25' '45.761'; ...
'30' '45.568'; ...
'35' '45.698'; ...
'40' '45.601'; ...
'45' '45.62'; ...
'50' '45.336'; ...
'55' '45.543'; ...
'60' '45.53'; ...
'65' '45.45'; ...
'70' '45.396'; ...
'80' '45.409'; ...
'90' '45.432'; ...
'100' '45.361'; ...
'150' '45.217'; ...
'200' '45.173'});
model.component('comp1').material('mat6').propertyGroup('def').func('int2').set('fununit',
{'1'});

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model.component('comp1').material('mat6').propertyGroup('def').func('int2').set('argunit',
{'1'});
model.component('comp1').material('mat6').propertyGroup('def').func('int3').label('Interpolat
ion 3');
model.component('comp1').material('mat6').propertyGroup('def').func('int3').set('funcname',
'C_rho');
model.component('comp1').material('mat6').propertyGroup('def').func('int3').set('table', {'0'
'1004.4'; ...
'5' '1003.8'; ...
'10' '1002.5'; ...
'15' '1002'; ...
'20' '1001'; ...
'25' '999.63'; ...
'30' '998.66'; ...
'35' '996.7'; ...
'40' '994.89'; ...
'45' '992.84'; ...
'50' '991.51'; ...
'55' '988.4'; ...
'60' '985.91'; ...
'65' '983.39'; ...
'70' '980.71'; ...
'80' '974.59'; ...
'90' '967.98'; ...
'100' '960.99'; ...
'150' '919.52'; ...
'200' '869.35'});
model.component('comp1').material('mat6').propertyGroup('def').func('int3').set('fununit',
{'1'});
model.component('comp1').material('mat6').propertyGroup('def').func('int3').set('argunit',
{'1'});
model.component('comp1').material('mat6').propertyGroup('def').set('diffusion', {'3.75e-
9[m^2/s]' '0' '0' '0' '3.75e-9[m^2/s]' '0' '0' '0' '3.75e-9[m^2/s]'});
model.component('comp1').material('mat6').propertyGroup('def').set('INFO_PREFIX:diffusion'
, ['B. Paxton and J. Newman, J. Electrochem. Soc., vol. 144, no. 11, (1997) 3818'
native2unicode(hex2dec({'20' '13'}), 'unicode') '3831, ']);
model.component('comp1').material('mat6').propertyGroup('def').set('T_reg',
'min(max(T,0[degC]),200[degC])');
model.component('comp1').material('mat6').propertyGroup('def').descr('T_reg', '');
model.component('comp1').material('mat6').propertyGroup('def').set('M_reg',
'min(max(c,1e-6[M]),12[M])/1[M]');
model.component('comp1').material('mat6').propertyGroup('def').descr('M_reg', '');
model.component('comp1').material('mat6').propertyGroup('def').set('density',
'(A_rho(T_degC)*M_reg^2+B_rho(T_degC)*M_reg+C_rho(T_degC))*1[kg/m^3]');

```



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model.component('comp1').material('mat6').propertyGroup('def').set('INFO_PREFIX:density',
['R.J. Gilliam, J.W. Graydonb, D.W. Kirkb, S.J. Thorpea, Int. J. Hydrogen Energy 32 (2007) 359
' native2unicode(hex2dec({'20' '13'}), 'unicode') ' 364']);
model.component('comp1').material('mat6').propertyGroup('def').set('T_degC', '(T_reg-
0[degC])/1[K]');
model.component('comp1').material('mat6').propertyGroup('def').descr('T_degC', '');
model.component('comp1').material('mat6').propertyGroup('def').addInput('concentration');
model.component('comp1').material('mat6').propertyGroup('def').addInput('temperature');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').label('E
lectrolyte conductivity');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').set('sig
mal', {'(A*M+B*M^2+C*M*T_K+D*M/T_K+E*M^3+F*M^2*T_K^2)*1[S/cm]' '0' '0' '0'
'(A*M+B*M^2+C*M*T_K+D*M/T_K+E*M^3+F*M^2*T_K^2)*1[S/cm]' '0' '0' '0'
'(A*M+B*M^2+C*M*T_K+D*M/T_K+E*M^3+F*M^2*T_K^2)*1[S/cm]'});
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').set('IN
FO_PREFIX:sigmal', ['R.J. Gilliam, J.W. Graydonb, D.W. Kirkb, S.J. Thorpea, Int. J. Hydrogen
Energy 32 (2007) 359 ' native2unicode(hex2dec({'20' '13'}), 'unicode') ' 364']);
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').set('T_
K', 'def.T_reg/1[K]');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').descr('
T_K', '');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').set('M',
'def.M_reg');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').descr('
M', '');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').set('A',
'-2.041');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').descr('
A', '');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').set('B',
'-0.0028');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').descr('
B', '');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').set('C',
'0.005332');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').descr('
C', '');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').set('D',
'207.2');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').descr('
D', '');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').set('E',
'0.001043');

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model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').descr('
E', '');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').set('F',
'-0.0000003');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').descr('
F', '');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').addInp
ut('concentration');
model.component('comp1').material('mat6').propertyGroup('ElectrolyteConductivity').addInp
ut('temperature');
model.component('comp1').material('mat6').propertyGroup('SpeciesProperties').label('Specie
s properties');
model.component('comp1').material('mat6').propertyGroup('SpeciesProperties').set('transpN
um', '0.22');
model.component('comp1').material('mat6').propertyGroup('SpeciesProperties').set('INFO_P
REFIX:transpNum', ['B. Paxton and J. Newman, J. Electrochem. Soc., vol. 144, no. 11, (1997)
3818' native2unicode(hex2dec({'20' '13'}), 'unicode') '3831, ']);
model.component('comp1').material('mat6').propertyGroup('SpeciesProperties').set('fcl', '2');
model.component('comp1').material('mat6').propertyGroup('SpeciesProperties').set('INFO_P
REFIX:fcl', ['B. Paxton and J. Newman, J. Electrochem. Soc., vol. 144, no. 11, (1997) 3818'
native2unicode(hex2dec({'20' '13'}), 'unicode') '3831, ']);
model.component('comp1').material('mat2').active(false);
model.component('comp1').material('mat1').active(false);
model.component('comp1').material('mat6').selection.set([2]);
model.component('comp1').material.create('effmat1', 'Effective');
model.component('comp1').material.remove('effmat1');

model.component('comp1').geom('geom1').run('r3');

model.component('comp1').material.remove('mat2');
model.component('comp1').material.remove('mat1');

model.component('comp1').geom('geom1').run('r4');
model.component('comp1').geom('geom1').run('r5');
model.component('comp1').geom('geom1').run('fin');

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');

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model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);

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model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

model.component('comp1').physics('cd').feature('pce1').selection.set([1 3 7 8 9 10 11 12]);
model.component('comp1').physics('cd').feature('pce1').selection.all;
model.component('comp1').physics('cd').feature('pce1').selection.set([3 4 5 6 7 8 9 10 11
12]);
model.component('comp1').physics('cd').feature('pot1').selection.set([]);

```

```

model.component('comp1').physics('cd').feature('egnd1').selection.set([]);
model.component('comp1').physics('cd').feature('pot1').selection.all;
model.component('comp1').physics('cd').feature('pot1').selection.set([3]);
model.component('comp1').physics('cd').feature('pce1').selection.set([1 3 4 5 6 7 8 9 10 11
12]);
model.component('comp1').physics('cd').feature('egnd1').selection.set([9 12 15 18 21 24 27
30 33 36]);

```

```

model.material('mat4').propertyGroup('def').set('electricconductivity', {'3.8[S/m]});
model.material('mat5').propertyGroup('def').set('electricconductivity', {'1000[S/m]});

```

```

model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').feature('ptgr1').selection.all;
model.result('pg9').feature('ptgr1').selection.set([6 8 10 12 14 16 18 20 22 24 26]);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);

```

```

model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

```

```

model.component('comp1').physics('cd').feature('pce1').feature('pdl1').set('Cdl',
'1000[F/m^2]');

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);

```

```

model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');

```



```

model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

```

```

model.component('comp1').material('mat3').propertyGroup('def').set('electricconductivity',
{'32.4[S/m]}');
model.component('comp1').material.create('mat7', 'Common');
model.component('comp1').material('mat7').propertyGroup.create('ElectrodePotential',
'Equilibrium potential');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func.create(
'int1', 'Interpolation');
model.component('comp1').material('mat7').propertyGroup.create('OperationalSOC',
'Operational electrode state of charge');
model.component('comp1').material('mat7').propertyGroup.create('EquilibriumConcentratio
n', 'Equilibrium concentration');
model.component('comp1').material('mat7').label('Hard Carbon (Negative, Li-ion Battery)');
model.component('comp1').material('mat7').comments(['\vs Li/Li+, T=25 C' newline 'Eeq for
fully lithiated at 0.79' newline 'Eeq for delithiated at 0.02' newline  newline 'Reference'
newline 'D. P Karthikeyan, G. Sikha, and R. E. White, ' native2unicode(hex2dec({'20' '1c'}),
'unicode') 'Thermodynamic model development for lithium intercalation electrodes,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Power Sources, vol. 185, p. 1398, 2008.'
newline ]]);
model.component('comp1').material('mat7').propertyGroup('def').label('Basic');

```

```

model.component('comp1').material('mat7').propertyGroup('def').set('diffusion', {'3.9e-
14[m^2/s]' '0' '0' '0' '3.9e-14[m^2/s]' '0' '0' '0' '3.9e-14[m^2/s]'});
model.component('comp1').material('mat7').propertyGroup('def').set('electricconductivity',
{'100[S/m]' '0' '0' '0' '100[S/m]' '0' '0' '0' '100[S/m]'});
model.component('comp1').material('mat7').propertyGroup('def').set('density',
'2260[kg/m^3]');
model.component('comp1').material('mat7').propertyGroup('def').set('csmx',
'30550[mol/m^3]');
model.component('comp1').material('mat7').propertyGroup('def').descr('csmx', '');
model.component('comp1').material('mat7').propertyGroup('def').addInput('concentration');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').label('Equili
brium potential');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').l
abel('Interpolation 1');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('funcname', 'Eeq_int1');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('table', {'0.0210' '0.7144'; ...
'0.0356' '0.6297'; ...
'0.0501' '0.5851'; ...
'0.0703' '0.5540'; ...
'0.0935' '0.5228'; ...
'0.1050' '0.5051'; ...
'0.1223' '0.4873'; ...
'0.1368' '0.4650'; ...
'0.1541' '0.4518'; ...
'0.1714' '0.4295'; ...
'0.1887' '0.4162'; ...
'0.2032' '0.3940'; ...
'0.2176' '0.3761'; ...
'0.2349' '0.3585'; ...
'0.2522' '0.3452'; ...
'0.2811' '0.3096'; ...
'0.2984' '0.2963'; ...
'0.3129' '0.2785'; ...
'0.3302' '0.2608'; ...
'0.3446' '0.2475'; ...
'0.3648' '0.2342'; ...
'0.3792' '0.2209'; ...
'0.3965' '0.2076'; ...
'0.4110' '0.1943'; ...
'0.4283' '0.1810'; ...
'0.4426' '0.1676'; ...
'0.4571' '0.1588'; ...

```

```

'0.4773' '0.1500'; ...
'0.4917' '0.1367'; ...
'0.5119' '0.1279'; ...
'0.5263' '0.1190'; ...
'0.5407' '0.1102'; ...
'0.5580' '0.0969'; ...
'0.5753' '0.0880'; ...
'0.5897' '0.0836'; ...
'0.6040' '0.0748'; ...
'0.6214' '0.0660'; ...
'0.6358' '0.0616'; ...
'0.6531' '0.0572'; ...
'0.6703' '0.0528'; ...
'0.6848' '0.0485'; ...
'0.7020' '0.0484'; ...
'0.7193' '0.0442'; ...
'0.7337' '0.0398'; ...
'0.7510' '0.0397'; ...
'0.7682' '0.0355'; ...
'0.7826' '0.0318'; ...
'0.7913' '0.0310'});
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('interp', 'piecewisecubic');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('extrap', 'linear');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('fununit', {'V'});
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('argunit', {'1'});
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('defineinv', true);
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('funcinvname', 'Eeq_inv');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').set('Eeq',
'Eeq_int1(soc)');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').set('INFO_P
REFIX:Eeq', ['D. P Karthikeyan, G. Sikha, and R. E. White, ' native2unicode(hex2dec({'20' '1c'}),
'unicode') 'Thermodynamic model development for lithium intercalation electrodes,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Power Sources, vol. 185, p. 1398, 2008.'];
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').set('dEeqdT
', '0[V/K]');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').set('cEeqref
', 'def.csmx');

```

```

model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').set('soc',
'c/cEeqref');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').descr('soc',
'');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').addInput('c
oncentration');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').label('Operati
onal electrode state of charge');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').set('socmax',
'elpot.Eeq_inv(E_min)');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').set('socmin',
'elpot.Eeq_inv(E_max)');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').set('E_max',
'0.7[V]');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').set('E_min',
'0.05[V]');
model.component('comp1').material('mat7').propertyGroup('EquilibriumConcentration').labe
l('Equilibrium concentration');
model.component('comp1').material('mat7').propertyGroup('EquilibriumConcentration').set('
csEq', 'def.csmax*elpot.Eeq_inv(V)');
model.component('comp1').material('mat7').propertyGroup('EquilibriumConcentration').addI
nput('electricpotential');
model.component('comp1').material('mat7').selection.set([1]);
model.component('comp1').material.remove('mat7');
model.component('comp1').material('mat3').propertyGroup('ElectrolyteConductivity').set('sig
mal', {100[S/m]});

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');

```

```

model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('linesweeptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsmethod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('linesweeptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsmethod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

```

```

model.material('mat5').propertyGroup.create('ElectrolyteConductivity',
'Electrolyte_conductivity');
model.material('mat5').propertyGroup('ElectrolyteConductivity').set('signal', {'100[S/m]});

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');

```

```

model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

model.component('comp1').material.create('mat7', 'Common');
model.component('comp1').material('mat7').propertyGroup('def').func.create('int1',
'Interpolation');
model.component('comp1').material('mat7').propertyGroup('def').func.create('int2',
'Interpolation');
model.component('comp1').material('mat7').propertyGroup.create('ElectrodePotential',
'Equilibrium potential');

```



```

model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func.create(
'int1', 'Interpolation');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func.create(
'int2', 'Interpolation');
model.component('comp1').material('mat7').propertyGroup.create('OperationalSOC',
'Operational electrode state of charge');
model.component('comp1').material('mat7').propertyGroup.create('ic', 'Intercalation strain');
model.component('comp1').material('mat7').propertyGroup('ic').func.create('int1',
'Interpolation');
model.component('comp1').material('mat7').propertyGroup.create('EquilibriumConcentratio
n', 'Equilibrium concentration');
model.component('comp1').material('mat7').label('Graphite, LixC6 MCMB (Negative, Li-ion
Battery)');
model.component('comp1').material('mat7').propertyGroup('def').label('Basic');
model.component('comp1').material('mat7').propertyGroup('def').func('int1').label('Interpolat
ion 1');
model.component('comp1').material('mat7').propertyGroup('def').func('int1').set('funcname',
'E_int');
model.component('comp1').material('mat7').propertyGroup('def').func('int1').set('table', {'0'
'32.47'; '0.333' '28.56'; '0.5' '58.06'; '1' '108.67'});
model.component('comp1').material('mat7').propertyGroup('def').func('int1').set('fununit',
{'GPa'});
model.component('comp1').material('mat7').propertyGroup('def').func('int1').set('argunit',
{'1'});
model.component('comp1').material('mat7').propertyGroup('def').func('int2').label('Interpolat
ion 2');
model.component('comp1').material('mat7').propertyGroup('def').func('int2').set('funcname',
'nu_int');
model.component('comp1').material('mat7').propertyGroup('def').func('int2').set('table', {'0'
'0.32'; '0.333' '0.39'; '0.5' '0.34'; '1' '0.24'});
model.component('comp1').material('mat7').propertyGroup('def').func('int2').set('fununit',
{''});
model.component('comp1').material('mat7').propertyGroup('def').set('youngsm modulus', '');
model.component('comp1').material('mat7').propertyGroup('def').set('poissonsratio', '');
model.component('comp1').material('mat7').propertyGroup('def').set('youngsm modulus',
'E_int(c/csmx)');
model.component('comp1').material('mat7').propertyGroup('def').set('INFO_PREFIX:youngsm
odulus', 'Yue Qi et al 2010 J. Electrochem. Soc. 157 A558');
model.component('comp1').material('mat7').propertyGroup('def').set('poissonsratio',
'nu_int(c/csmx)');
model.component('comp1').material('mat7').propertyGroup('def').set('INFO_PREFIX:poissons
ratio', 'Yue Qi et al 2010 J. Electrochem. Soc. 157 A558');
model.component('comp1').material('mat7').propertyGroup('def').set('electricconductivity',
{'100[S/m]' '0' '0' '0' '100[S/m]' '0' '0' '0' '100[S/m]'});

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model.component('comp1').material('mat7').propertyGroup('def').set('INFO_PREFIX:electricc
onductivity', ['V. Srinivasan, and J. Newman, ' native2unicode(hex2dec({'20' '1c'}), 'unicode')
'Design and Optimization of a Natural Graphite/Iron Phosphate Lithium Ion Cell,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Electrochem. Soc., vol. 151, p. 1530,
2004.']);
model.component('comp1').material('mat7').propertyGroup('def').set('diffusion', {'1.4523e-
13*exp(68025.7/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]' '0' '0' '0' '1.4523e-
13*exp(68025.7/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]' '0' '0' '0' '1.4523e-
13*exp(68025.7/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]'});
model.component('comp1').material('mat7').propertyGroup('def').set('INFO_PREFIX:diffusion'
, ['K. Kumaresan, G. Sikha, and R. E. White, ' native2unicode(hex2dec({'20' '1c'}), 'unicode')
'Thermal Model for a Li-Ion Cell,' native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J.
Electrochem. Soc., vol. 155, p. A164, 2008.']);
model.component('comp1').material('mat7').propertyGroup('def').set('thermalconductivity',
{'1[W/(m*K)]' '0' '0' '0' '1[W/(m*K)]' '0' '0' '0' '1[W/(m*K)]'});
model.component('comp1').material('mat7').propertyGroup('def').set('INFO_PREFIX:thermalc
onductivity', 'S. Chen, C. Wan, and Y. Wang, J. Power Sources, 140, 111 (2005).');
model.component('comp1').material('mat7').propertyGroup('def').set('heatcapacity',
'750[J/(kg*K)]');
model.component('comp1').material('mat7').propertyGroup('def').set('INFO_PREFIX:heatcapa
city', 'SI Chemical Data, John Wiley & Sons, 1994');
model.component('comp1').material('mat7').propertyGroup('def').set('density',
'2300[kg/m^3]');
model.component('comp1').material('mat7').propertyGroup('def').set('INFO_PREFIX:density',
'SI Chemical Data, John Wiley & Sons, 1994');
model.component('comp1').material('mat7').propertyGroup('def').set('csmax',
'31507[mol/m^3]');
model.component('comp1').material('mat7').propertyGroup('def').descr('csmax', '');
model.component('comp1').material('mat7').propertyGroup('def').set('T_ref', '318[K]');
model.component('comp1').material('mat7').propertyGroup('def').descr('T_ref', '');
model.component('comp1').material('mat7').propertyGroup('def').set('T2',
'min(393.15,max(T,223.15))');
model.component('comp1').material('mat7').propertyGroup('def').descr('T2', '');
model.component('comp1').material('mat7').propertyGroup('def').addInput('temperature');
model.component('comp1').material('mat7').propertyGroup('def').addInput('concentration');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').label('Equili
brium potential');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').l
abel('Interpolation 1');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('funcname', 'Eeq_int1');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('table', {'0' '2.781186612'; ...
'0.01' '1.520893224'; ...

```

'0.02' '0.893922607'; ...
'0.03' '0.581284406'; ...
'0.04' '0.42452844'; ...
'0.05' '0.344895805'; ...
'0.06' '0.303146342'; ...
'0.07' '0.279578072'; ...
'0.08' '0.264093089'; ...
'0.09' '0.251347845'; ...
'0.1' '0.238588379'; ...
'0.11' '0.224803164'; ...
'0.12' '0.210294358'; ...
'0.13' '0.196408586'; ...
'0.14' '0.184624188'; ...
'0.15' '0.175188157'; ...
'0.16' '0.167373311'; ...
'0.17' '0.160452107'; ...
'0.18' '0.154025412'; ...
'0.19' '0.147948522'; ...
'0.2' '0.142214997'; ...
'0.21' '0.13688271'; ...
'0.22' '0.132033114'; ...
'0.23' '0.127747573'; ...
'0.24' '0.124091616'; ...
'0.25' '0.121103387'; ...
'0.26' '0.11878567'; ...
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'0.46' '0.107900592'; ...
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'0.69' '0.077327934'; ...
'0.7' '0.077258337'; ...
'0.71' '0.077184077'; ...
'0.72' '0.077103499'; ...
'0.73' '0.077014851'; ...
'0.74' '0.076916258'; ...
'0.75' '0.07680571'; ...
'0.76' '0.07668104'; ...
'0.77' '0.07653992'; ...
'0.78' '0.076379839'; ...
'0.79' '0.076198086'; ...
'0.8' '0.075991699'; ...
'0.81' '0.075757371'; ...
'0.82' '0.075491288'; ...
'0.83' '0.075188813'; ...
'0.84' '0.07484398'; ...
'0.85' '0.074448647'; ...
'0.86' '0.07399118'; ...
'0.87' '0.073454466'; ...
'0.88' '0.072812991'; ...
'0.89' '0.072028722'; ...

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'0.9' '0.071045433'; ...
'0.91' '0.069780996'; ...
'0.92' '0.068116222'; ...
'0.93' '0.065874599'; ...
'0.94' '0.062770873'; ...
'0.95' '0.058253898'; ...
'0.96' '0.051075794'; ...
'0.97' '0.038790069'; ...
'0.98' '0.020172191'});
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('interp', 'piecewisecubic');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('extrap', 'linear');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('fununit', {'V'});
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('argunit', {''});
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('defineinv', true);
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int1').
set('funcinvname', 'Eeq_inv');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int2').l
abel('Interpolation 2');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int2').
set('funcname', 'dEeqdT_int1');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int2').
set('table', {'0' '3.0e-4'; ...
'0.17' '0'; ...
'0.24' '-6e-5'; ...
'0.28' '-1.6e-4'; ...
'0.5' '-1.6e-4'; ...
'0.54' '-9e-5'; ...
'0.71' '-9e-5'; ...
'0.85' '-1.0e-4'; ...
'1.0' '-1.2e-4'});
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int2').
set('fununit', {'V/K'});
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').func('int2').
set('argunit', {''});
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').set('Eeq',
'Eeq_int1(soc)+dEeqdT_int1(soc)*(T-298[K])');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').set('INFO_P
REFIX:Eeq', ['D. P. Karthikeyan, G. Sikha, and R. E. White, ' native2unicode(hex2dec({'20' '1c'}),

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'unicode') 'Thermodynamic model development for lithium intercalation electrodes,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Power Sources, vol. 185, p. 1398, 2008.'];
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').set('dEeqdT
', 'dEeqdT_int1(soc)');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').set('INFO_P
REFIX:dEeqdT', ['K. E. Thomas, and J. Newman, ' native2unicode(hex2dec({'20' '1c'}),
'unicode') 'Heats of mixing and of entropy in porous insertion electrodes,'
native2unicode(hex2dec({'20' '1d'}), 'unicode') ' J. Power Sources., vol. 119-121, p. 844,
2003.']);
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').set('cEeqref
', 'def.csmx');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').set('soc',
'c/cEeqref');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').descr('soc',
'');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').addInput('c
oncentration');
model.component('comp1').material('mat7').propertyGroup('ElectrodePotential').addInput('t
emperature');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').label('Operati
onal electrode state of charge');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').set('socmax',
'elpot.Eeq_inv(E_min)');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').set('socmin',
'elpot.Eeq_inv(E_max)');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').set('E_max',
'1[V]');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').set('E_min',
'0.075[V]');
model.component('comp1').material('mat7').propertyGroup('ic').label('Intercalation strain');
model.component('comp1').material('mat7').propertyGroup('ic').func('int1').label('Interpolatio
n 1');
model.component('comp1').material('mat7').propertyGroup('ic').func('int1').set('funcname',
'dVOLdSOL');
model.component('comp1').material('mat7').propertyGroup('ic').func('int1').set('table', {'0'
'0'; ...
'0.006802721088435382' '0.12500000000000178'; ...
'0.06316812439261421' '1.2736486486486491'; ...
'0.11175898931000966' '2.523648648648649'; ...
'0.17978620019436342' '3.5709459459459474'; ...
'0.2400388726919339' '4.449324324324325'; ...
'0.2905733722060252' '5.192567567567568'; ...
'0.3566569484936831' '5.66554054054054'; ...
'0.4188532555879494' '5.969594594594595'; ...

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'0.48104956268221566' '6.10472972972973'; ...
'0.5432458697764819' '6.173648648648647'; ...
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'0.6112730806608356' '7.726351351351352'; ...
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'0.694849368318756' '9.449324324324323'; ...
'0.7414965986394557' '10.29391891891892'; ...
'0.7764820213799805' '10.902027027027025'; ...
'0.8231292517006802' '11.543918918918918'; ...
'0.8542274052478133' '12.152027027027026'; ...
'0.8833819241982507' '12.827702702702702'; ...
'0.9183673469387755' '12.996621621621621'; ...
'0.9494655004859086' '13.16554054054054'}});
model.component('comp1').material('mat7').propertyGroup('ic').func('int1').set('extrap',
'linear');
model.component('comp1').material('mat7').propertyGroup('ic').func('int1').set('fununit',
{'%'});
model.component('comp1').material('mat7').propertyGroup('ic').func('int1').set('argunit',
{'1'});
model.component('comp1').material('mat7').propertyGroup('ic').set('dvol',
'dVOLdSOL(c/def.csmax)');
model.component('comp1').material('mat7').propertyGroup('ic').set('INFO_PREFIX:dvol', ['S.
Schweidler, L. de Biasi, A. Schiele, P. Hartmann, T. Brezesinski and J. Janek, "Volume Changes
of Graphite Anodes Revisited: A Combined Operando X-Ray Diffraction and In Situ Pressure
Analysis Study", J. Phys. Chem. C, 2018, 122, 8829' native2unicode(hex2dec({'20' '13'}),
'unicode') '8835']);
model.component('comp1').material('mat7').propertyGroup('ic').addInput('concentration');
model.component('comp1').material('mat7').propertyGroup('EquilibriumConcentration').label('Equilibrium concentration');
model.component('comp1').material('mat7').propertyGroup('EquilibriumConcentration').set('csEq', 'def.csmax*elpot.Eeq_inv(V)');
model.component('comp1').material('mat7').propertyGroup('EquilibriumConcentration').addInput('electricpotential');
model.component('comp1').material('mat7').selection.set([12]);
model.component('comp1').material('mat7').propertyGroup.create('ElectrolyteConductivity',
'Electrolyte_conductivity');
model.component('comp1').material('mat7').propertyGroup('ElectrolyteConductivity').set('sigma', {'100[S/m]});

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');

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model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');

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model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

model.component('comp1').material('mat7').selection.set([4 6 8 10 12]);
model.component('comp1').material.create('mat8', 'Common');

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model.component('comp1').material('mat8').propertyGroup.create('ElectrodePotential',
'Equilibrium potential');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func.create(
'int1', 'Interpolation');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func.create(
'int2', 'Interpolation');
model.component('comp1').material('mat8').propertyGroup.create('OperationalSOC',
'Operational electrode state of charge');
model.component('comp1').material('mat8').propertyGroup.create('EquilibriumConcentratio
n', 'Equilibrium concentration');
model.component('comp1').material('mat8').propertyGroup.create('ElectrolyteConductivity',
[native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'89' 'e3'}),
'unicode') native2unicode(hex2dec({'8d' '28'}), 'unicode') native2unicode(hex2dec({'75'
'35'}), 'unicode') native2unicode(hex2dec({'5b' 'fc'}), 'unicode')
native2unicode(hex2dec({'73' '87'}), 'unicode') ]);
model.component('comp1').material('mat8').label('ZnMnO4');
model.component('comp1').material('mat8').propertyGroup('def').label('Basic');
model.component('comp1').material('mat8').propertyGroup('def').set('youngsmodulus', '');
model.component('comp1').material('mat8').propertyGroup('def').set('poissonsratio', '');
model.component('comp1').material('mat8').propertyGroup('def').set('youngsmodulus',
'194[GPa]');
model.component('comp1').material('mat8').propertyGroup('def').set('INFO_PREFIX:youngsm
odulus', 'Yue Qi et al 2014 J. Electrochem. Soc. 161 F3010');
model.component('comp1').material('mat8').propertyGroup('def').set('poissonsratio', '0.26');
model.component('comp1').material('mat8').propertyGroup('def').set('INFO_PREFIX:poissons
ratio', 'Yue Qi et al 2014 J. Electrochem. Soc. 161 F3010');
model.component('comp1').material('mat8').propertyGroup('def').set('electricconductivity',
{'3e3[S/m]' '0' '0' '0' '3e3[S/m]' '0' '0' '0' '3e3[S/m]'});
model.component('comp1').material('mat8').propertyGroup('def').set('INFO_PREFIX:electricc
onductivity', 'V. Srinivasan and C.Y. Wang, "Analysis of Electrochemical and Thermal
Behavior of Li-Ion Cells," J. Electrochem. Soc., vol. 150, p. A98, 2003');
model.component('comp1').material('mat8').propertyGroup('def').set('diffusion', {'1e-
14*exp(20000/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]' '0' '0' '0' '1e-
14*exp(20000/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]' '0' '0' '0' '1e-
14*exp(20000/8.314*(1/(T_ref/1[K])-1/(T2/1[K])))[m^2/s]'});
model.component('comp1').material('mat8').propertyGroup('def').set('INFO_PREFIX:diffusion'
, 'V. Srinivasan and C.Y. Wang, "Analysis of Electrochemical and Thermal Behavior of Li-Ion
Cells," J. Electrochem. Soc., vol. 150, p. A98, 2003');
model.component('comp1').material('mat8').propertyGroup('def').set('density',
'1950[kg/m^3]');
model.component('comp1').material('mat8').propertyGroup('def').set('INFO_PREFIX:density',
'N. Nitta, F. Wu, J. Tae Lee, and G. Yushin, Materials Today, Volume 18, Number 5, June
2015');
model.component('comp1').material('mat8').propertyGroup('def').set('T_ref', '298[K]');

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model.component('comp1').material('mat8').propertyGroup('def').descr('T_ref', '');
model.component('comp1').material('mat8').propertyGroup('def').set('T2',
'min(393.15,max(T,223.15))');
model.component('comp1').material('mat8').propertyGroup('def').descr('T2', '');
model.component('comp1').material('mat8').propertyGroup('def').set('csmax',
'22860[mol/m^3]');
model.component('comp1').material('mat8').propertyGroup('def').descr('csmax', '');
model.component('comp1').material('mat8').propertyGroup('def').set('relpermeability', {'1' '0'
'0' '0' '1' '0' '0' '0' '1'});
model.component('comp1').material('mat8').propertyGroup('def').set('heatcapacity',
'710[J/(kg*K)]');
model.component('comp1').material('mat8').propertyGroup('def').set('relpermittivity', {'1' '0'
'0' '0' '1' '0' '0' '0' '1'});
model.component('comp1').material('mat8').propertyGroup('def').set('emissivity', '1');
model.component('comp1').material('mat8').propertyGroup('def').set('thermalconductivity',
{'150[W/(m*K)]*(300[K]/T)' '0' '0' '0' '150[W/(m*K)]*(300[K]/T)' '0' '0' '0'
'150[W/(m*K)]*(300[K]/T)'});
model.component('comp1').material('mat8').propertyGroup('def').addInput('temperature');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').label('Equili
brium potential');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int1').l
abel('Interpolation 1');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int1').
set('funcname', 'Eeq_int1');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int1').
set('table', {'0.1750' '4.2763'; ...
'0.1950' '4.1898'; ...
'0.2150' '4.1507'; ...
'0.2350' '4.133'; ...
'0.2550' '4.1248'; ...
'0.2750' '4.1209'; ...
'0.2950' '4.119'; ...
'0.3150' '4.1179'; ...
'0.3350' '4.1171'; ...
'0.3550' '4.1165'; ...
'0.3750' '4.116'; ...
'0.3950' '4.1153'; ...
'0.4150' '4.1145'; ...
'0.4350' '4.1135'; ...
'0.4550' '4.1121'; ...
'0.4750' '4.1099'; ...
'0.4950' '4.1066'; ...
'0.5150' '4.1014'; ...
'0.5350' '4.0934'; ...

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'0.5550' '4.082'; ...
'0.5750' '4.067'; ...
'0.5950' '4.05'; ...
'0.6150' '4.0333'; ...
'0.6350' '4.0192'; ...
'0.6550' '4.0087'; ...
'0.6750' '4.0012'; ...
'0.6950' '3.996'; ...
'0.7150' '3.9923'; ...
'0.7350' '3.9893'; ...
'0.7550' '3.9867'; ...
'0.7750' '3.9841'; ...
'0.7950' '3.9813'; ...
'0.8150' '3.9783'; ...
'0.8350' '3.9747'; ...
'0.8550' '3.9705'; ...
'0.8750' '3.9652'; ...
'0.8950' '3.9585'; ...
'0.9150' '3.9493'; ...
'0.9350' '3.9361'; ...
'0.9550' '3.9144'; ...
'0.9750' '3.869'; ...
'0.9950' '3.5944'; ...
'' ''');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int1').
set('interp', 'piecewisecubic');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int1').
set('extrap', 'linear');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int1').
set('fununit', {'V'});
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int1').
set('argunit', {''});
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int1').
set('defineinv', true);
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int1').
set('funcinvname', 'Eeq_inv');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int2').l
abel('Interpolation 2');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int2').
set('funcname', 'dEeqdT_int1');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int2').
set('table', {'0.15' '0.15e-3'; ...
'0.18' '0.25e-3'; ...
'0.20' '0.21e-3'; ...

```

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'0.209' '0.19e-3'; ...
'0.26' '0.175e-3'; ...
'0.28' '0.166e-3'; ...
'0.30' '0.155e-3'; ...
'0.35' '0.11e-3'; ...
'0.394' '0.095e-3'; ...
'0.41' '0.05e-3'; ...
'0.437' '0.02e-3'; ...
'0.445' '0'; ...
'0.46' '-0.048e-3'; ...
'0.48' '-0.15e-3'; ...
'0.50' '-0.255e-3'; ...
'0.515' '-0.3e-3'; ...
'0.545' '-0.3e-3'; ...
'0.553' '-0.22e-3'; ...
'0.58' '-0.145e-3'; ...
'0.592' '-0.10e-3'; ...
'0.60' '0'; ...
'0.62' '0.08e-3'; ...
'0.64' '0.12e-3'; ...
'0.70' '0.124e-3'; ...
'0.72' '0.10e-3'; ...
'0.73' '0.05e-3'; ...
'0.76' '0'; ...
'0.78' '-0.057e-3'; ...
'0.81' '-0.08e-3'; ...
'0.86' '-0.10e-3'; ...
'0.91' '-0.16e-3'; ...
'0.96' '-0.22e-3'; ...
'0.98' '-0.30e-3'});
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int2').
set('interp', 'piecewisecubic');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int2').
set('fununit', {'V/K'});
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').func('int2').
set('argunit', {'});
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').set('Eeq',
'Eeq_int1(soc)+dEeqdT_int1(soc)*(T-298[K])');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').set('INFO_P
REFIX:Eeq', 'V. Srinivasan and C.Y. Wang, "Analysis of Electrochemical and Thermal Behavior
of Li-Ion Cells," J. Electrochem. Soc., vol. 150, p. A98, 2003');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').set('dEeqdT
', 'dEeqdT_int1(soc)');

```

```

model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').set('INFO_P
REFIX:dEeqdT', 'V. Srinivasan and C.Y. Wang, "Analysis of Electrochemical and Thermal
Behavior of Li-Ion Cells," J. Electrochem. Soc., vol. 150, p. A98, 2003');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').set('cEeqref
', 'def.csmax');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').set('INFO_P
REFIX:cEeqref', 'V. Srinivasan and C.Y. Wang, "Analysis of Electrochemical and Thermal
Behavior of Li-Ion Cells," J. Electrochem. Soc., vol. 150, p. A98, 2003');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').set('soc',
'c/cEeqref');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').descr('soc',
'');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').addInput('c
oncentration');
model.component('comp1').material('mat8').propertyGroup('ElectrodePotential').addInput('t
emperature');
model.component('comp1').material('mat8').propertyGroup('OperationalSOC').label('Operati
onal electrode state of charge');
model.component('comp1').material('mat8').propertyGroup('OperationalSOC').set('socmax',
'elpot.Eeq_inv(E_min)');
model.component('comp1').material('mat8').propertyGroup('OperationalSOC').set('socmin',
'elpot.Eeq_inv(E_max)');
model.component('comp1').material('mat8').propertyGroup('OperationalSOC').set('E_max',
'4.2[V]');
model.component('comp1').material('mat8').propertyGroup('OperationalSOC').set('E_min',
'3.9[V]');
model.component('comp1').material('mat8').propertyGroup('EquilibriumConcentration').labe
l('Equilibrium concentration');
model.component('comp1').material('mat8').propertyGroup('EquilibriumConcentration').set('
csEq', 'def.csmax*elpot.Eeq_inv(V)');
model.component('comp1').material('mat8').propertyGroup('EquilibriumConcentration').addI
nput('electricpotential');
model.component('comp1').material('mat8').propertyGroup('ElectrolyteConductivity').set('sig
mal', {'2[S/m]' '0' '0' '0' '2[S/m]' '0' '0' '0' '2[S/m]'});
model.component('comp1').material('mat8').selection.set([3 5 7 9 11]);
model.material.remove('mat5');
model.material.remove('mat4');

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');

```

```

model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');

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```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;

```



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model.result('pg9').run;

model.param.set('V_max', '1.6[V]');
model.param.set('v', '0.05[V/s]');

model.component('comp1').geom('geom1').run('fin');
model.component('comp1').geom('geom1').run('fin');

model.component('comp1').mesh('mesh1').run;
model.component('comp1').mesh('mesh1').run;

model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').set('xlabelactive', true);
model.result('pg9').set('ylabelactive', true);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);

```

```

model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg8').run;
model.result('pg9').run;
model.result.export.create('anim1', 'Animation');
model.result.export('anim1').set('target', 'player');
model.result.export('anim1').set('plotgroup', 'pg9');
model.result.export('anim1').run;
model.result.export('anim1').showFrame;
model.result.export('anim1').run;
model.result('pg1').run;
model.result('pg2').run;
model.result('pg2').setIndex('looplevel', 12, 0);
model.result('pg2').run;
model.result('pg9').run;
model.result('pg9').run;

```

```

model.component('comp1').material('mat8').propertyGroup('ElectrolyteConductivity').set('sig
mal', {'50[S/m]}');
model.component('comp1').material('mat8').propertyGroup('def').set('electricconductivity',
{'3.8[S/m]}');

```

```

model.component('comp1').material('mat7').propertyGroup('def').set('electricconductivity',
{'1000[S/m]}');
model.component('comp1').material('mat3').propertyGroup('OperationalSOC').set('E_min',
{'0[V]}');
model.component('comp1').material('mat3').propertyGroup('OperationalSOC').set('E_max',
{'4.2[V]}');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').set('E_min',
{'0[V]}');
model.component('comp1').material('mat7').propertyGroup('OperationalSOC').set('E_max',
{'4.2[V]}');
model.component('comp1').material('mat8').propertyGroup('OperationalSOC').set('E_min',
{'0[V]}');
model.component('comp1').material('mat3').propertyGroup('ElectrolyteConductivity').set('sig
mal', {'80[S/m]}');

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');

```

```

model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').feature('ptgr1').set('data', 'dset1');
model.result('pg9').run;
model.result('pg9').run;

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');

```

```

model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('linesweeptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsmethod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('linesweeptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsmethod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg8').run;
model.result('pg1').run;
model.result.table.create('evl2', 'Table');
model.result.table('evl2').comments([native2unicode(hex2dec({'4e' 'a4'}), 'unicode')
native2unicode(hex2dec({'4e' '92'}), 'unicode') native2unicode(hex2dec({'76' '84'}),
'unicode') native2unicode(hex2dec({'4e' '8c'}), 'unicode') native2unicode(hex2dec({'7e'
'f4'}), 'unicode') native2unicode(hex2dec({'50' '3c'}), 'unicode') ]);
model.result.table('evl2').label('Evaluation 2D');
model.result.table('evl2').addRow([2.800316333770752 9.613924026489258
3.2915488726186826E-6], [0 0 0]);

```



```

model.result('pg1').setIndex('looplevel', 5, 0);
model.result('pg1').run;
model.result('pg1').setIndex('looplevel', 1, 0);
model.result('pg9').run;
model.result('pg9').feature('ptgr1').set('xdatadescractive', true);
model.result('pg9').feature('ptgr1').set('descractive', true);
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').feature('ptgr1').selection.set([4 6 8 10 12 14 16 18 20 22 24 26]);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');

```

```

model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').feature('ptgr1').selection.set([4]);
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;

```

```

model.component('comp1').geom('geom1').feature('r12').active(false);
model.component('comp1').geom('geom1').feature('r11').active(false);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});

```

```

model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);

```

```

model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').feature('ptgr1').set('legend', true);
model.result('pg9').set('ylog', false);
model.result('pg9').set('xlog', false);

model.component('comp1').geom('geom1').feature('r10').active(false);
model.component('comp1').geom('geom1').feature('r9').active(false);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');

```

```

model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;

model.sol('sol1').study('std1');

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```

model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);

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model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

```

```

model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r8').active(false);
model.component('comp1').geom('geom1').feature('r7').active(false);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');

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model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);

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model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r6').active(false);
model.component('comp1').geom('geom1').feature('r5').active(false);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);

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model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');

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model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r5').active(true);
model.component('comp1').geom('geom1').feature('r6').active(true);
model.component('comp1').geom('geom1').feature('r7').active(true);
model.component('comp1').geom('geom1').feature('r8').active(true);
model.component('comp1').geom('geom1').feature('r9').active(true);
model.component('comp1').geom('geom1').feature('r10').active(true);
model.component('comp1').geom('geom1').feature('r11').active(true);
model.component('comp1').geom('geom1').feature('r12').active(true);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');

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model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');

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model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

model.component('comp1').geom('geom1').runPre('fin');
model.component('comp1').geom('geom1').runPre('fin');
model.component('comp1').geom('geom1').run('fin');

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');

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model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');

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model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

model.component('comp1').geom('geom1').feature('r11').active(false);
model.component('comp1').geom('geom1').feature('r12').active(false);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');

```

```

model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

model.component('comp1').geom('geom1').feature('r11').active(true);
model.component('comp1').geom('geom1').feature('r12').active(true);
model.component('comp1').geom('geom1').run('r12');
model.component('comp1').geom('geom1').runPre('fin');
model.component('comp1').geom('geom1').run('fin');

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);

```

```

model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

```

```

model.component('comp1').material('mat8').selection.set([3 5 7 9 11]);
model.component('comp1').material('mat7').selection.set([4 6 8 10 12]);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');

```

```

model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);

```



```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').set('showlegends', false);
model.result('pg9').run;

```

```

model.label(['[LBL' native2unicode(hex2dec({'53' '47'}), 'unicode')
native2unicode(hex2dec({'7e' 'a7'}), 'unicode') 'JB' native2unicode(hex2dec({'7a' 'd9'}),
'unicode') '-' native2unicode(hex2dec({'8d' '85'}), 'unicode') native2unicode(hex2dec({'7e'
'a7'}), 'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'5b' 'b9'}), 'unicode') native2unicode(hex2dec({'56' '68'}),
'unicode') native2unicode(hex2dec({'76' '84'}), 'unicode') native2unicode(hex2dec({'5f'
'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
native2unicode(hex2dec({'4f' '0f'}), 'unicode') native2unicode(hex2dec({'5b' '89'}),
'unicode') native2unicode(hex2dec({'6c' 'd5'}), 'unicode') '--' native2unicode(hex2dec({'60'
'52'}), 'unicode') native2unicode(hex2dec({'53' '8b'}), 'unicode')
native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
'--CV' native2unicode(hex2dec({'66' 'f2'}), 'unicode') native2unicode(hex2dec({'7e' 'bf'}),
'unicode') ' - ' native2unicode(hex2dec({'52' '6f'}), 'unicode') native2unicode(hex2dec({'67'
'2c'}), 'unicode') '.mph']);

```

```

model.component('comp1').physics('cd').feature('pce1').selection.set([1 3 4 5 6 7 8 9 10 11
12]);
model.component('comp1').physics('cd').feature('egnd1').selection.set([9 12 15 21 27 33]);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');

```

```

model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r12').active(false);
model.component('comp1').geom('geom1').feature('r11').active(false);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);

```

```

model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;

```

```

model.component('comp1').geom('geom1').feature('r11').active(true);
model.component('comp1').geom('geom1').feature('r12').active(true);
model.component('comp1').geom('geom1').run;

```

```

model.component('comp1').material('mat8').selection.set([3 5 7 9 11]);
model.component('comp1').material('mat7').selection.set([4 6 8 10 12]);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');

```

```

model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),

```

```

'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)]];
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;

```

```

model.component('comp1').geom('geom1').run('r12');
model.component('comp1').geom('geom1').create('r13', 'Rectangle');
model.component('comp1').geom('geom1').feature('r13').set('size', [0.5 10]);
model.component('comp1').geom('geom1').feature('r13').set('pos', [5.55 0]);
model.component('comp1').geom('geom1').run('r13');
model.component('comp1').geom('geom1').create('r14', 'Rectangle');
model.component('comp1').geom('geom1').feature('r13').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 13ZMO']);
model.component('comp1').geom('geom1').feature('r14').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 14'
native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]);
model.component('comp1').geom('geom1').feature('r14').set('pos', [6.05 0]);
model.component('comp1').geom('geom1').feature('r14').set('size', [0.5 10]);
model.component('comp1').geom('geom1').run('r14');
model.component('comp1').geom('geom1').feature('r14').set('size', [0.01 10]);
model.component('comp1').geom('geom1').run('r14');

```



```

model.component('comp1').geom('geom1').runPre('fin');
model.component('comp1').geom('geom1').run('fin');

model.component('comp1').mesh('mesh1').run;

model.component('comp1').material('mat8').selection.set([3 5 7 9 11 13]);
model.component('comp1').material('mat7').selection.set([4 6 8 10 12 14]);

model.component('comp1').mesh('mesh1').run;

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');

```

```

model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;

```

```

model.label([native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'89'
'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') native2unicode(hex2dec({'77' 'f3'}),
'unicode') native2unicode(hex2dec({'58' 'a8'}), 'unicode') native2unicode(hex2dec({'70'
'ef'}), 'unicode') '-' native2unicode(hex2dec({'8d' '85'}), 'unicode')
native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'5b' 'b9'}), 'unicode') native2unicode(hex2dec({'56'
'68'}), 'unicode') native2unicode(hex2dec({'76' '84'}), 'unicode')
native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
native2unicode(hex2dec({'4f' '0f'}), 'unicode') native2unicode(hex2dec({'5b' '89'}),
'unicode') native2unicode(hex2dec({'6c' 'd5'}), 'unicode') native2unicode(hex2dec({'60'
'52'}), 'unicode') native2unicode(hex2dec({'53' '8b'}), 'unicode')
native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
'--CV' native2unicode(hex2dec({'66' 'f2'}), 'unicode') native2unicode(hex2dec({'7e' 'bf'}),
'unicode') '.mph']);

```

```

model.component('comp1').geom('geom1').feature('r4').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 3'
native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]);
model.component('comp1').geom('geom1').feature('r4').set('pos', [3 0]);
model.component('comp1').geom('geom1').run('r4');
model.component('comp1').geom('geom1').feature('r3').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') '4 ZMO']);
model.component('comp1').geom('geom1').feature.move('r3', 3);
model.component('comp1').geom('geom1').feature('r3').set('pos', [3.01 0]);
model.component('comp1').geom('geom1').run('r3');

```

```

model.component('comp1').geom('geom1').feature('r6').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 5'
native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]]);
model.component('comp1').geom('geom1').feature('r6').set('pos', [3.51 0]);
model.component('comp1').geom('geom1').run('r6');
model.component('comp1').geom('geom1').feature('r5').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 6 ZMO']]);
model.component('comp1').geom('geom1').feature('r5').set('pos', [3.52 0]);
model.component('comp1').geom('geom1').run('r5');
model.component('comp1').geom('geom1').run('r6');
model.component('comp1').geom('geom1').runPre('fin');
model.component('comp1').geom('geom1').run('r6');
model.component('comp1').geom('geom1').feature.move('r6', 4);
model.component('comp1').geom('geom1').run('r1');
model.component('comp1').geom('geom1').run('r2');
model.component('comp1').geom('geom1').run('r4');
model.component('comp1').geom('geom1').run('r3');
model.component('comp1').geom('geom1').run('r6');
model.component('comp1').geom('geom1').run('r5');
model.component('comp1').geom('geom1').feature.move('r8', 6);
model.component('comp1').geom('geom1').feature('r8').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 7'
native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]]);
model.component('comp1').geom('geom1').feature('r8').set('pos', [4.02 0]);
model.component('comp1').geom('geom1').run('r8');
model.component('comp1').geom('geom1').feature('r7').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 8 ZMO']]);
model.component('comp1').geom('geom1').feature('r7').set('pos', [4.03 0]);
model.component('comp1').geom('geom1').run('r7');
model.component('comp1').geom('geom1').feature.move('r9', 9);
model.component('comp1').geom('geom1').feature('r10').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 9 '
native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]]);
model.component('comp1').geom('geom1').feature('r10').set('pos', [4.52 0]);
model.component('comp1').geom('geom1').run('r10');
model.component('comp1').geom('geom1').feature('r9').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 10 ZMO']]);
model.component('comp1').geom('geom1').run('r9');
model.component('comp1').geom('geom1').feature.move('r11', 11);
model.component('comp1').geom('geom1').feature('r12').label([native2unicode(hex2dec({'77'
'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 11 '

```

```

native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]];
model.component('comp1').geom('geom1').feature('r12').set('pos', [5.03 0]);
model.component('comp1').geom('geom1').run('r12');
model.component('comp1').geom('geom1').feature('r11').label([native2unicode(hex2dec({'77'
' 'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 12 ZMO']));
model.component('comp1').geom('geom1').run('r11');
model.component('comp1').geom('geom1').feature.move('r13', 13);
model.component('comp1').geom('geom1').feature('r14').label([native2unicode(hex2dec({'77'
' 'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 13'
native2unicode(hex2dec({'77' 'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}),
'unicode') native2unicode(hex2dec({'70' 'ef'}), 'unicode') ]);
model.component('comp1').geom('geom1').feature('r14').set('pos', [5.54 0]);
model.component('comp1').geom('geom1').run('r14');
model.component('comp1').geom('geom1').feature('r13').label([native2unicode(hex2dec({'77'
' 'e9'}), 'unicode') native2unicode(hex2dec({'5f' '62'}), 'unicode') ' 14 ZMO']));
model.component('comp1').geom('geom1').run('r13');
model.component('comp1').geom('geom1').run('fin');
model.component('comp1').geom('geom1').run('fin');

```

```

model.component('comp1').physics('cd').feature('pce1').selection.set([1 3 4 5 6 7 8 9 10 11
12 13 14]);
model.component('comp1').physics('cd').feature('egnd1').selection.set([9 12 15 18 21 24 27
30 33 36 39 42]);

```

```

model.component('comp1').mesh('mesh1').run;

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');

```

```

model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('linesweeptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsmethod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('linesweeptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsmethod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;
model.result('pg9').run;

```

```

model.label([native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'89'
'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') native2unicode(hex2dec({'77' 'f3'}),
'unicode') native2unicode(hex2dec({'58' 'a8'}), 'unicode') native2unicode(hex2dec({'70'
'ef'}), 'unicode') '-' native2unicode(hex2dec({'8d' '85'}), 'unicode')
native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'5b' 'b9'}), 'unicode') native2unicode(hex2dec({'56'
'68'}), 'unicode') native2unicode(hex2dec({'76' '84'}), 'unicode')

```

```

native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
native2unicode(hex2dec({'4f' '0f'}), 'unicode') native2unicode(hex2dec({'5b' '89'}),
'unicode') native2unicode(hex2dec({'6c' 'd5'}), 'unicode') native2unicode(hex2dec({'60'
'52'}), 'unicode') native2unicode(hex2dec({'53' '8b'}), 'unicode')
native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
'--CV' native2unicode(hex2dec({'66' 'f2'}), 'unicode') native2unicode(hex2dec({'7e' 'bf'}),
'unicode') '.mph']);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');

```



```

model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg8').run;
model.result('pg9').run;
model.result('pg9').run;

```

```

model.component('comp1').geom('geom1').feature('r13').active(false);
model.component('comp1').geom('geom1').feature('r14').active(false);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);

```

```

model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);

```

```

model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r11').active(false);
model.component('comp1').geom('geom1').feature('r12').active(false);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');

```

```

model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;

```

```

model.component('comp1').geom('geom1').feature('r9').active(false);
model.component('comp1').geom('geom1').feature('r10').active(false);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');

```

```

model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;

```



```

model.component('comp1').geom('geom1').feature('r7').active(false);
model.component('comp1').geom('geom1').feature('r8').active(false);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('react', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),

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'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)]];
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)]];
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');

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model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r6').active(false);
model.component('comp1').geom('geom1').feature('r5').active(false);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');

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model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;

```

```

model.label([native2unicode(hex2dec({'30' '10'}), 'unicode') native2unicode(hex2dec({'7e'
'b3'}), 'unicode') native2unicode(hex2dec({'7c' '73'}), 'unicode')
native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'30' '11'}),
'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'89'
'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') native2unicode(hex2dec({'77' 'f3'}),
'unicode') native2unicode(hex2dec({'58' 'a8'}), 'unicode') native2unicode(hex2dec({'70'
'ef'}), 'unicode') '-' native2unicode(hex2dec({'8d' '85'}), 'unicode')
native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'5b' 'b9'}), 'unicode') native2unicode(hex2dec({'56'
'68'}), 'unicode') native2unicode(hex2dec({'76' '84'}), 'unicode')
native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
native2unicode(hex2dec({'4f' '0f'}), 'unicode') native2unicode(hex2dec({'5b' '89'}),
'unicode') native2unicode(hex2dec({'6c' 'd5'}), 'unicode') native2unicode(hex2dec({'60'
'52'}), 'unicode') native2unicode(hex2dec({'53' '8b'}), 'unicode')
native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
'--CV' native2unicode(hex2dec({'66' 'f2'}), 'unicode') native2unicode(hex2dec({'7e' 'bf'}),
'unicode') ' - ' native2unicode(hex2dec({'52' '6f'}), 'unicode') native2unicode(hex2dec({'67'
'2c'}), 'unicode') '.mph'];

```

```

model.result('pg9').run;

```

```

model.component('comp1').geom('geom1').lengthUnit('nm');

```

```

model.component('comp1').geom('geom1').run('fin');
model.component('comp1').geom('geom1').run('fin');
model.component('comp1').geom('geom1').runPre('fin');
model.component('comp1').geom('geom1').run('r1');

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');

```

```

model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;

```

```

model.component('comp1').geom('geom1').lengthUnit([native2unicode(hex2dec({'00' 'b5'}),
'unicode') 'm']);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');

```



```

model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;

```

```

model.label([native2unicode(hex2dec({'30' '10'}), 'unicode') native2unicode(hex2dec({'7e'
'b3'}), 'unicode') native2unicode(hex2dec({'7c' '73'}), 'unicode')
native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'30' '11'}),
'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'89'
'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') native2unicode(hex2dec({'77' 'f3'}),
'unicode') native2unicode(hex2dec({'58' 'a8'}), 'unicode') native2unicode(hex2dec({'70'
'ef'}), 'unicode') '-' native2unicode(hex2dec({'8d' '85'}), 'unicode')
native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'5b' 'b9'}), 'unicode') native2unicode(hex2dec({'56'
'68'}), 'unicode') native2unicode(hex2dec({'76' '84'}), 'unicode')
native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
native2unicode(hex2dec({'4f' '0f'}), 'unicode') native2unicode(hex2dec({'5b' '89'}),
'unicode') native2unicode(hex2dec({'6c' 'd5'}), 'unicode') native2unicode(hex2dec({'60'
'52'}), 'unicode') native2unicode(hex2dec({'53' '8b'}), 'unicode')
native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73' 'af'}), 'unicode')
'--CV' native2unicode(hex2dec({'66' 'f2'}), 'unicode') native2unicode(hex2dec({'7e' 'bf'}),
'unicode') ' - ' native2unicode(hex2dec({'52' '6f'}), 'unicode') native2unicode(hex2dec({'67'
'2c'}), 'unicode') '.mph'];

```

```

model.component('comp1').geom('geom1').run('r1');
model.component('comp1').geom('geom1').run('r2');

```

```

model.component('comp1').geom('geom1').run('r4');
model.component('comp1').geom('geom1').run('r3');

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('react', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),

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'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)]];
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)]];
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r6').active(true);
model.component('comp1').geom('geom1').feature('r5').active(true);
model.component('comp1').geom('geom1').run;

model.component('comp1').material('mat7').selection.set([3 5]);
model.component('comp1').material('mat8').selection.set([4 6]);

model.result('pg6').run;

model.component('comp1').physics('cd').feature('pce1').selection.set([1 3 4 5 6]);
model.component('comp1').physics('cd').feature('egnd1').selection.set([9 12 15 18]);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');

```

```

model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');

```

```

model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r8').active(true);
model.component('comp1').geom('geom1').feature('r7').active(true);
model.component('comp1').geom('geom1').feature('r10').active(true);
model.component('comp1').geom('geom1').feature('r9').active(true);
model.component('comp1').geom('geom1').feature('r12').active(true);
model.component('comp1').geom('geom1').feature('r11').active(true);
model.component('comp1').geom('geom1').feature('r14').active(true);
model.component('comp1').geom('geom1').feature('r13').active(true);
model.component('comp1').geom('geom1').run('fin');
model.component('comp1').geom('geom1').run('fin');

model.component('comp1').material('mat7').selection.set([3 5 7 9 11 13]);
model.component('comp1').material('mat8').selection.set([4 6 8 10 12 14]);

```

```

model.component('comp1').physics('cd').feature('pce1').selection.set([1 3 4 5 6 7 8 9 10 11
12 13 14]);
model.component('comp1').physics('cd').feature('egnd1').selection.set([9 12 15 18 21 24 27
30 33 36 39 42]);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');

```



```

model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;

```

```

model.component('comp1').geom('geom1').feature('r13').active(false);
model.component('comp1').geom('geom1').feature('r14').active(false);

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');

```

```

model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');

```

```

model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r11').active(false);
model.component('comp1').geom('geom1').feature('r12').active(false);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});

```

```

model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);

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model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r9').active(false);
model.component('comp1').geom('geom1').feature('r10').active(false);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');

```

```

model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r7').active(false);
model.component('comp1').geom('geom1').feature('r8').active(false);

model.sol('sol1').study('std1');

```



```

model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);

```

```

model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

```

```

model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg9').run;

model.component('comp1').geom('geom1').feature('r5').active(false);
model.component('comp1').geom('geom1').feature('r6').active(false);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');
model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reactf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');

```

```

model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);

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model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;
model.result('pg9').run;
model.result('pg2').run;
model.result('pg3').run;
model.result('pg4').run;
model.result('pg4').setIndex('looplevel', 5, 0);
model.result('pg4').setIndex('looplevel', 1, 0);
model.result('pg7').run;
model.result('pg8').run;

```

```

model.component('comp1').geom('geom1').feature('r6').active(true);
model.component('comp1').geom('geom1').feature('r5').active(true);
model.component('comp1').geom('geom1').run('r1');
model.component('comp1').geom('geom1').run('r2');
model.component('comp1').geom('geom1').run('r4');
model.component('comp1').geom('geom1').run('r3');

```

```

model.label([native2unicode(hex2dec({'30' '10'}), 'unicode') 'EIS'
native2unicode(hex2dec({'5f' 'ae'}), 'unicode') native2unicode(hex2dec({'7c' '73'}),
'unicode') native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'30'
'11'}), 'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'89' 'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}),
'unicode') native2unicode(hex2dec({'63' 'a5'}), 'unicode') native2unicode(hex2dec({'77'
'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}), 'unicode')
native2unicode(hex2dec({'70' 'ef'}), 'unicode') '-' native2unicode(hex2dec({'8d' '85'}),
'unicode') native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'75'
'35'}), 'unicode') native2unicode(hex2dec({'5b' 'b9'}), 'unicode')
native2unicode(hex2dec({'56' '68'}), 'unicode') native2unicode(hex2dec({'76' '84'}),
'unicode') native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73'
'af'}), 'unicode') native2unicode(hex2dec({'4f' '0f'}), 'unicode')
native2unicode(hex2dec({'5b' '89'}), 'unicode') native2unicode(hex2dec({'6c' 'd5'}),
'unicode') native2unicode(hex2dec({'60' '52'}), 'unicode') native2unicode(hex2dec({'53'
'8b'}), 'unicode') native2unicode(hex2dec({'5f' 'aa'}), 'unicode')

```

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native2unicode(hex2dec({'73' 'af'}), 'unicode') '--CV' native2unicode(hex2dec({'66' 'f2'}),
'unicode') native2unicode(hex2dec({'7e' 'bf'}), 'unicode') '.mph']);

model.component('comp1').geom('geom1').feature('r8').active(true);
model.component('comp1').geom('geom1').feature('r7').active(true);
model.component('comp1').geom('geom1').feature('r10').active(true);
model.component('comp1').geom('geom1').feature('r9').active(true);
model.component('comp1').geom('geom1').run;

model.component('comp1').material('mat8').selection.set([4 6 8 10]);
model.component('comp1').material('mat7').selection.set([3 5 7 9]);

model.component('comp1').physics('cd').feature('pce1').selection.set([1 3 4 5 6 7 8 9 10]);
model.component('comp1').physics('cd').feature('egnd1').selection.set([9 12 15 18 21 24 27
30]);
model.component('comp1').physics('cd').feature('pot1').create('hp1', 'HarmonicPerturbation',
1);
model.component('comp1').physics('cd').feature('pot1').feature('hp1').set('deltaphis',
'0.01[V]');
model.component('comp1').physics('cd').feature('pot1').set('phisbnd', 3);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('t1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'time');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scalemethod', 'manual');
model.sol('sol1').feature('v1').feature('comp1_phil').set('scaleval', '1');
model.sol('sol1').feature('v1').feature('comp1_phis').set('scaleval', '1');
model.sol('sol1').feature('v1').set('control', 'time');
model.sol('sol1').create('t1', 'Time');
model.sol('sol1').feature('t1').set('tlist', 'range(0,tH/10,tH*4)');
model.sol('sol1').feature('t1').set('plot', 'off');
model.sol('sol1').feature('t1').set('plotgroup', 'pg1');
model.sol('sol1').feature('t1').set('plotfreq', 'tout');
model.sol('sol1').feature('t1').set('probesel', 'all');
model.sol('sol1').feature('t1').set('probes', {});
model.sol('sol1').feature('t1').set('probefreq', 'tsteps');
model.sol('sol1').feature('t1').set('rtol', 0.001);
model.sol('sol1').feature('t1').set('atolglobalvaluemethod', 'factor');

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model.sol('sol1').feature('t1').set('eventout', true);
model.sol('sol1').feature('t1').set('reacf', true);
model.sol('sol1').feature('t1').set('storeudot', true);
model.sol('sol1').feature('t1').set('endtimeinterpolation', true);
model.sol('sol1').feature('t1').set('maxorder', 2);
model.sol('sol1').feature('t1').set('control', 'time');
model.sol('sol1').feature('t1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('t1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}), 'unicode')
native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').create('i1', 'Iterative');
model.sol('sol1').feature('t1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('t1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('t1').create('i2', 'Iterative');
model.sol('sol1').feature('t1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('t1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('t1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),

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'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)]];
model.sol('sol1').feature('t1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter', 1);
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('t1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver'
, 'pardiso');
model.sol('sol1').feature('t1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('t1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('t1').feature.remove('fcDef');
model.sol('sol1').attach('std1');

model.study.remove('std1');
model.study.create('std1');
model.study('std1').create('frlin', 'Frequencylinearized');
model.study('std1').feature('frlin').set('solnum', 'auto');
model.study('std1').feature('frlin').set('notsolnum', 'auto');
model.study('std1').feature('frlin').set('outputmap', {});
model.study('std1').feature('frlin').set('ngenAUX', '1');
model.study('std1').feature('frlin').set('goalngenAUX', '1');
model.study('std1').feature('frlin').set('ngenAUX', '1');
model.study('std1').feature('frlin').set('goalngenAUX', '1');
model.study('std1').feature('frlin').setSolveFor('/physics/cd', true);
model.study('std1').feature('frlin').set('plist', 'range(0.01,100,100000)');

model.sol.create('sol1');
model.sol('sol1').study('std1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'frlin');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').set('control', 'frlin');
model.sol('sol1').create('s1', 'Stationary');

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model.sol('sol1').feature('s1').set('stol', 1.0E-4);
model.sol('sol1').feature('s1').create('p1', 'Parametric');
model.sol('sol1').feature('s1').feature.remove('pDef');
model.sol('sol1').feature('s1').feature('p1').set('pname', {'freq'});
model.sol('sol1').feature('s1').feature('p1').set('plistarr', {'range(0.01,100,100000)'});
model.sol('sol1').feature('s1').feature('p1').set('punit', {'Hz'});
model.sol('sol1').feature('s1').feature('p1').set('pcontinuationmode', 'no');
model.sol('sol1').feature('s1').feature('p1').set('preusesol', 'no');
model.sol('sol1').feature('s1').feature('p1').set('pdistrib', 'off');
model.sol('sol1').feature('s1').feature('p1').set('plot', 'off');
model.sol('sol1').feature('s1').feature('p1').set('plotgroup', 'Default');
model.sol('sol1').feature('s1').feature('p1').set('probesel', 'all');
model.sol('sol1').feature('s1').feature('p1').set('probes', {});
model.sol('sol1').feature('s1').feature('p1').set('control', 'frlin');
model.sol('sol1').feature('s1').set('nonlin', 'linper');
model.sol('sol1').feature('s1').set('storelinpoint', true);
model.sol('sol1').feature('s1').set('linsolnum', 'all');
model.sol('sol1').feature('s1').set('control', 'frlin');
model.sol('sol1').feature('s1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('s1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}),
'unicode') native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').create('i1', 'Iterative');
model.sol('sol1').feature('s1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('s1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');

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model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter',
1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsm
ethod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('s1').create('i2', 'Iterative');
model.sol('sol1').feature('s1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('s1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter',
1);
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsm
ethod', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('s1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result.create('pg1', 'PlotGroup1D');
model.result('pg1').set('data', 'dset1');
model.result('pg1').create('nyq1', 'Nyquist');
model.result('pg1').feature('nyq1').set('unit', {'});
model.result('pg1').feature('nyq1').set('expr', {'conj(cd.Zvsgrnd_pot1) '});

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model.result('pg1').feature('nyq1').set('descr', {'});
model.result('pg1').label([native2unicode(hex2dec({'5b' 'f9'}), 'unicode')
native2unicode(hex2dec({'57' '30'}), 'unicode') native2unicode(hex2dec({'96' '3b'}),
'unicode') native2unicode(hex2dec({'62' '97'}), 'unicode') , Nyquist (cd)]];
model.result('pg1').feature('nyq1').setIndex('descr', [native2unicode(hex2dec({'5b' 'f9'}),
'unicode') native2unicode(hex2dec({'57' '30'}), 'unicode') native2unicode(hex2dec({'96'
'3b'}), 'unicode') native2unicode(hex2dec({'62' '97'}), 'unicode') ], 0);
model.result('pg1').feature('nyq1').set('differential', 'off');
model.result('pg1').feature('nyq1').set('autodescr', 'off');
model.result('pg1').set('preserveaspect', 'on');
model.result('pg1').set('xlabelactive', true);
model.result('pg1').set('xlabel', 'real(Z) (\Omega m<sup>2</sup>));
model.result('pg1').set('ylabelactive', true);
model.result('pg1').set('ylabel', '-imag(Z) (\Omega m<sup>2</sup>));
model.result.create('pg2', 'PlotGroup1D');
model.result('pg2').set('data', 'dset1');
model.result('pg2').create('glob1', 'Global');
model.result('pg2').feature('glob1').set('unit', {'});
model.result('pg2').feature('glob1').set('expr', {'real(conj(cd.Zvsgrnd_pot1)) '});
model.result('pg2').feature('glob1').set('descr', {'});
model.result('pg2').label([native2unicode(hex2dec({'5b' 'f9'}), 'unicode')
native2unicode(hex2dec({'57' '30'}), 'unicode') native2unicode(hex2dec({'96' '3b'}),
'unicode') native2unicode(hex2dec({'62' '97'}), 'unicode') , ' native2unicode(hex2dec({'5b'
'9e'}), 'unicode') native2unicode(hex2dec({'90' 'e8'}), 'unicode') ' (cd)]];
model.result('pg2').feature('glob1').setIndex('descr', [native2unicode(hex2dec({'5b' 'f9'}),
'unicode') native2unicode(hex2dec({'57' '30'}), 'unicode') native2unicode(hex2dec({'96'
'3b'}), 'unicode') native2unicode(hex2dec({'62' '97'}), 'unicode') , '
native2unicode(hex2dec({'5b' '9e'}), 'unicode') native2unicode(hex2dec({'90' 'e8'}),
'unicode') ], 0);
model.result('pg2').feature('glob1').set('differential', 'off');
model.result('pg2').feature('glob1').set('xdata', 'expr');
model.result('pg2').feature('glob1').set('xdataexpr', 'freq');
model.result('pg2').feature('glob1').set('autodescr', 'off');
model.result('pg2').feature('glob1').set('xdatasolnumtype', 'level1');
model.result('pg2').set('xlog', 'on');
model.result('pg2').set('ylabelactive', true);
model.result('pg2').set('ylabel', 'real(Z) (\Omega m<sup>2</sup>));
model.result.create('pg3', 'PlotGroup1D');
model.result('pg3').set('data', 'dset1');
model.result('pg3').create('glob1', 'Global');
model.result('pg3').feature('glob1').set('unit', {'});
model.result('pg3').feature('glob1').set('expr', {'imag(conj(cd.Zvsgrnd_pot1)) '});
model.result('pg3').feature('glob1').set('descr', {'});

```

```

model.result('pg3').label([native2unicode(hex2dec({'5b' 'f9'}), 'unicode')
native2unicode(hex2dec({'57' '30'}), 'unicode') native2unicode(hex2dec({'96' '3b'}),
'unicode') native2unicode(hex2dec({'62' '97'}), 'unicode') ', ' native2unicode(hex2dec({'86'
'5a'}), 'unicode') native2unicode(hex2dec({'90' 'e8'}), 'unicode') ' (cd)']);
model.result('pg3').feature('glob1').setIndex('descr', [native2unicode(hex2dec({'5b' 'f9'}),
'unicode') native2unicode(hex2dec({'57' '30'}), 'unicode') native2unicode(hex2dec({'96'
'3b'}), 'unicode') native2unicode(hex2dec({'62' '97'}), 'unicode') ', '
native2unicode(hex2dec({'86' '5a'}), 'unicode') native2unicode(hex2dec({'90' 'e8'}),
'unicode') ], 0);
model.result('pg3').feature('glob1').set('differential', 'off');
model.result('pg3').feature('glob1').set('xdata', 'expr');
model.result('pg3').feature('glob1').set('xdataexpr', 'freq');
model.result('pg3').feature('glob1').set('autodescr', 'off');
model.result('pg3').feature('glob1').set('xdatasolnumtype', 'level1');
model.result('pg3').set('xlog', 'on');
model.result('pg3').set('ylabelactive', true);
model.result('pg3').set('ylabel', '-imag(Z) (\Omega m<sup>2</sup>));
model.result('pg1').run;
model.result('pg1').run;
model.result('pg1').run;

```

```

model.component('comp1').geom('geom1').run('fin');

```

```

model.component('comp1').physics('cd').feature('pot1').set('phisbnd', '3[V]');

```

```

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('s1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'frlin');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').set('control', 'frlin');
model.sol('sol1').create('s1', 'Stationary');
model.sol('sol1').feature('s1').set('stol', 1.0E-4);
model.sol('sol1').feature('s1').create('p1', 'Parametric');
model.sol('sol1').feature('s1').feature.remove('pDef');
model.sol('sol1').feature('s1').feature('p1').set('pname', {'freq'});
model.sol('sol1').feature('s1').feature('p1').set('plistarr', {'range(0.01,100,100000)});
model.sol('sol1').feature('s1').feature('p1').set('punit', {'Hz'});
model.sol('sol1').feature('s1').feature('p1').set('pcontinuationmode', 'no');
model.sol('sol1').feature('s1').feature('p1').set('preusesol', 'no');
model.sol('sol1').feature('s1').feature('p1').set('pdistrib', 'off');

```

```

model.sol('sol1').feature('s1').feature('p1').set('plot', 'off');
model.sol('sol1').feature('s1').feature('p1').set('plotgroup', 'pg1');
model.sol('sol1').feature('s1').feature('p1').set('probesel', 'all');
model.sol('sol1').feature('s1').feature('p1').set('probes', {});
model.sol('sol1').feature('s1').feature('p1').set('control', 'frlin');
model.sol('sol1').feature('s1').set('nonlin', 'linper');
model.sol('sol1').feature('s1').set('storelinpoint', true);
model.sol('sol1').feature('s1').set('linpsolnum', 'all');
model.sol('sol1').feature('s1').set('control', 'frlin');
model.sol('sol1').feature('s1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('s1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}),
'unicode') native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').create('i1', 'Iterative');
model.sol('sol1').feature('s1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('s1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter',
1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsm
ethod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('s1').create('i2', 'Iterative');

```

```

model.sol('sol1').feature('s1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('s1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter',
1);
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsm
ethod', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('s1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg1').run;
model.result('pg2').run;
model.result('pg3').run;
model.result('pg3').feature('glob1').set('differential', true);
model.result('pg3').run;
model.result('pg3').feature('glob1').set('differential', false);

model.component('comp1').physics('cd').feature('pot1').set('phisbnd', '1.6[V]');

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('s1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');

```

```

model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'fmlin');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').set('control', 'fmlin');
model.sol('sol1').create('s1', 'Stationary');
model.sol('sol1').feature('s1').set('stol', 1.0E-4);
model.sol('sol1').feature('s1').create('p1', 'Parametric');
model.sol('sol1').feature('s1').feature.remove('pDef');
model.sol('sol1').feature('s1').feature('p1').set('pname', {'freq'});
model.sol('sol1').feature('s1').feature('p1').set('plistarr', {'range(0.01,100,100000)'});
model.sol('sol1').feature('s1').feature('p1').set('punit', {'Hz'});
model.sol('sol1').feature('s1').feature('p1').set('pcontinuationmode', 'no');
model.sol('sol1').feature('s1').feature('p1').set('preusesol', 'no');
model.sol('sol1').feature('s1').feature('p1').set('pdistrib', 'off');
model.sol('sol1').feature('s1').feature('p1').set('plot', 'off');
model.sol('sol1').feature('s1').feature('p1').set('plotgroup', 'pg1');
model.sol('sol1').feature('s1').feature('p1').set('probesel', 'all');
model.sol('sol1').feature('s1').feature('p1').set('probes', {});
model.sol('sol1').feature('s1').feature('p1').set('control', 'fmlin');
model.sol('sol1').feature('s1').set('nonlin', 'linper');
model.sol('sol1').feature('s1').set('storelinpoint', true);
model.sol('sol1').feature('s1').set('linsolnum', 'all');
model.sol('sol1').feature('s1').set('control', 'fmlin');
model.sol('sol1').feature('s1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('s1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}),
'unicode') native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').create('i1', 'Iterative');
model.sol('sol1').feature('s1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('s1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');

```

```

model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter',
1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsm
ethod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('s1').create('i2', 'Iterative');
model.sol('sol1').feature('s1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('s1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter',
1);
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsm
ethod', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('s1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;

```



```

model.result('pg2').run;
model.result('pg3').run;
model.result('pg2').run;
model.result('pg1').run;

model.component('comp1').physics('cd').feature('init1').set('phis', '1.6[V]');

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('s1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'frlin');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').set('control', 'frlin');
model.sol('sol1').create('s1', 'Stationary');
model.sol('sol1').feature('s1').set('stol', 1.0E-4);
model.sol('sol1').feature('s1').create('p1', 'Parametric');
model.sol('sol1').feature('s1').feature.remove('pDef');
model.sol('sol1').feature('s1').feature('p1').set('pname', {'freq'});
model.sol('sol1').feature('s1').feature('p1').set('plistarr', {'range(0.01,100,100000)'});
model.sol('sol1').feature('s1').feature('p1').set('punit', {'Hz'});
model.sol('sol1').feature('s1').feature('p1').set('pcontinuationmode', 'no');
model.sol('sol1').feature('s1').feature('p1').set('preusesol', 'no');
model.sol('sol1').feature('s1').feature('p1').set('pdistrib', 'off');
model.sol('sol1').feature('s1').feature('p1').set('plot', 'off');
model.sol('sol1').feature('s1').feature('p1').set('plotgroup', 'pg1');
model.sol('sol1').feature('s1').feature('p1').set('probesel', 'all');
model.sol('sol1').feature('s1').feature('p1').set('probes', {});
model.sol('sol1').feature('s1').feature('p1').set('control', 'frlin');
model.sol('sol1').feature('s1').set('nonlin', 'linper');
model.sol('sol1').feature('s1').set('storelinpoint', true);
model.sol('sol1').feature('s1').set('linpsolnum', 'all');
model.sol('sol1').feature('s1').set('control', 'frlin');
model.sol('sol1').feature('s1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('s1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}),
'unicode') native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').create('i1', 'Iterative');
model.sol('sol1').feature('s1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i1').set('nlinnormuse', 'on');

```

```

model.sol('sol1').feature('s1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i1').create('mg1', 'Multigrid');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter',
1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsm
ethod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('s1').create('i2', 'Iterative');
model.sol('sol1').feature('s1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('s1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter',
1);

```

```

model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsm
method', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('s1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

```

```

model.result('pg1').run;

```

```

model.label([native2unicode(hex2dec({'30' '10'}), 'unicode') 'EIS'
native2unicode(hex2dec({'5f' 'ae'}), 'unicode') native2unicode(hex2dec({'7c' '73'}),
'unicode') native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'30'
'11'}), 'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'89' 'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}),
'unicode') native2unicode(hex2dec({'63' 'a5'}), 'unicode') native2unicode(hex2dec({'77'
'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}), 'unicode')
native2unicode(hex2dec({'70' 'ef'}), 'unicode') '-' native2unicode(hex2dec({'8d' '85'}),
'unicode') native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'75'
'35'}), 'unicode') native2unicode(hex2dec({'5b' 'b9'}), 'unicode')
native2unicode(hex2dec({'56' '68'}), 'unicode') native2unicode(hex2dec({'76' '84'}),
'unicode') native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73'
'af'}), 'unicode') native2unicode(hex2dec({'4f' '0f'}), 'unicode')
native2unicode(hex2dec({'5b' '89'}), 'unicode') native2unicode(hex2dec({'6c' 'd5'}),
'unicode') native2unicode(hex2dec({'60' '52'}), 'unicode') native2unicode(hex2dec({'53'
'8b'}), 'unicode') native2unicode(hex2dec({'5f' 'aa'}), 'unicode')
native2unicode(hex2dec({'73' 'af'}), 'unicode') '--CV' native2unicode(hex2dec({'66' 'f2'}),
'unicode') native2unicode(hex2dec({'7e' 'bf'}), 'unicode') '.mph']);

```

```

model.result('pg1').run;
model.result('pg1').run;
model.result('pg2').run;
model.result('pg3').run;
model.result('pg1').run;
model.result.export.create('plot1', 'pg1', 'nyq1', 'Plot');
model.result.export('plot1').label('Nyquist');
model.result.export('plot1').set('filename', ['C:\Users\lenovo\Desktop\'
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'63' '6e'}),
'unicode') '\EIS' native2unicode(hex2dec({'65' '70'}), 'unicode')
native2unicode(hex2dec({'63' '6e'}), 'unicode') '\EIS' native2unicode(hex2dec({'53' '9f'}),
'unicode') native2unicode(hex2dec({'59' 'cb'}), 'unicode') native2unicode(hex2dec({'65'

```

```

'70'}), 'unicode') native2unicode(hex2dec({'63' '6e'}), 'unicode')
native2unicode(hex2dec({'5b' 'fc'}), 'unicode') native2unicode(hex2dec({'51' 'fa'}), 'unicode')
'\ native2unicode(hex2dec({'5f' 'ae'}), 'unicode') native2unicode(hex2dec({'7c' '73'}),
'unicode') native2unicode(hex2dec({'7e' 'a7'}), 'unicode') '-Nyquist.txt'];
model.result.export('plot1').run;
model.result('pg2').run;
model.result.export.create('plot2', 'pg2', 'glob1', 'Plot');
model.result.export('plot2').label([native2unicode(hex2dec({'5b' '9e'}), 'unicode')
native2unicode(hex2dec({'90' 'e8'}), 'unicode') ]);
model.result.export('plot2').set('filename', ['C:\Users\lenovo\Desktop\'
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'63' '6e'}),
'unicode') '\EIS' native2unicode(hex2dec({'65' '70'}), 'unicode')
native2unicode(hex2dec({'63' '6e'}), 'unicode') '\EIS' native2unicode(hex2dec({'53' '9f'}),
'unicode') native2unicode(hex2dec({'59' 'cb'}), 'unicode') native2unicode(hex2dec({'65'
'70'}), 'unicode') native2unicode(hex2dec({'63' '6e'}), 'unicode')
native2unicode(hex2dec({'5b' 'fc'}), 'unicode') native2unicode(hex2dec({'51' 'fa'}), 'unicode')
'\ native2unicode(hex2dec({'5f' 'ae'}), 'unicode') native2unicode(hex2dec({'7c' '73'}),
'unicode') native2unicode(hex2dec({'7e' 'a7'}), 'unicode') '-' native2unicode(hex2dec({'5b'
'9e'}), 'unicode') native2unicode(hex2dec({'90' 'e8'}), 'unicode') '.txt']);
model.result.export('plot2').run;
model.result('pg3').run;
model.result.export.create('plot3', 'pg3', 'glob1', 'Plot');
model.result.export('plot3').label([native2unicode(hex2dec({'86' '5a'}), 'unicode')
native2unicode(hex2dec({'90' 'e8'}), 'unicode') ]);
model.result.export('plot3').set('filename', ['C:\Users\lenovo\Desktop\'
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'63' '6e'}),
'unicode') '\EIS' native2unicode(hex2dec({'65' '70'}), 'unicode')
native2unicode(hex2dec({'63' '6e'}), 'unicode') '\EIS' native2unicode(hex2dec({'53' '9f'}),
'unicode') native2unicode(hex2dec({'59' 'cb'}), 'unicode') native2unicode(hex2dec({'65'
'70'}), 'unicode') native2unicode(hex2dec({'63' '6e'}), 'unicode')
native2unicode(hex2dec({'5b' 'fc'}), 'unicode') native2unicode(hex2dec({'51' 'fa'}), 'unicode')
'\ native2unicode(hex2dec({'5f' 'ae'}), 'unicode') native2unicode(hex2dec({'7c' '73'}),
'unicode') native2unicode(hex2dec({'7e' 'a7'}), 'unicode') '-' native2unicode(hex2dec({'86'
'5a'}), 'unicode') native2unicode(hex2dec({'90' 'e8'}), 'unicode') '.txt']);
model.result.export('plot3').run;

model.label([native2unicode(hex2dec({'30' '10'}), 'unicode') 'EIS'
native2unicode(hex2dec({'5f' 'ae'}), 'unicode') native2unicode(hex2dec({'7c' '73'}),
'unicode') native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'30'
'11'}), 'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'89' 'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}),
'unicode') native2unicode(hex2dec({'63' 'a5'}), 'unicode') native2unicode(hex2dec({'77'
'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}), 'unicode')
native2unicode(hex2dec({'70' 'ef'}), 'unicode') '-' native2unicode(hex2dec({'8d' '85'}),

```

```
'unicode') native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'75'
'35'}), 'unicode') native2unicode(hex2dec({'5b' 'b9'}), 'unicode')
native2unicode(hex2dec({'56' '68'}), 'unicode') native2unicode(hex2dec({'76' '84'}),
'unicode') native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73'
'af'}), 'unicode') native2unicode(hex2dec({'4f' '0f'}), 'unicode')
native2unicode(hex2dec({'5b' '89'}), 'unicode') native2unicode(hex2dec({'6c' 'd5'}),
'unicode') native2unicode(hex2dec({'60' '52'}), 'unicode') native2unicode(hex2dec({'53'
'8b'}), 'unicode') native2unicode(hex2dec({'5f' 'aa'}), 'unicode')
native2unicode(hex2dec({'73' 'af'}), 'unicode') '--CV native2unicode(hex2dec({'66' 'f2'}),
'unicode') native2unicode(hex2dec({'7e' 'bf'}), 'unicode') '.mph'];
```

```
model.result('pg2').run;
```

```
model.label([native2unicode(hex2dec({'30' '10'}), 'unicode') 'EIS'
native2unicode(hex2dec({'5f' 'ae'}), 'unicode') native2unicode(hex2dec({'7c' '73'}),
'unicode') native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'30'
'11'}), 'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'89' 'e3'}), 'unicode') native2unicode(hex2dec({'8d' '28'}),
'unicode') native2unicode(hex2dec({'63' 'a5'}), 'unicode') native2unicode(hex2dec({'77'
'f3'}), 'unicode') native2unicode(hex2dec({'58' 'a8'}), 'unicode')
native2unicode(hex2dec({'70' 'ef'}), 'unicode') '-' native2unicode(hex2dec({'8d' '85'}),
'unicode') native2unicode(hex2dec({'7e' 'a7'}), 'unicode') native2unicode(hex2dec({'75'
'35'}), 'unicode') native2unicode(hex2dec({'5b' 'b9'}), 'unicode')
native2unicode(hex2dec({'56' '68'}), 'unicode') native2unicode(hex2dec({'76' '84'}),
'unicode') native2unicode(hex2dec({'5f' 'aa'}), 'unicode') native2unicode(hex2dec({'73'
'af'}), 'unicode') native2unicode(hex2dec({'4f' '0f'}), 'unicode')
native2unicode(hex2dec({'5b' '89'}), 'unicode') native2unicode(hex2dec({'6c' 'd5'}),
'unicode') native2unicode(hex2dec({'60' '52'}), 'unicode') native2unicode(hex2dec({'53'
'8b'}), 'unicode') native2unicode(hex2dec({'5f' 'aa'}), 'unicode')
native2unicode(hex2dec({'73' 'af'}), 'unicode') '--CV native2unicode(hex2dec({'66' 'f2'}),
'unicode') native2unicode(hex2dec({'7e' 'bf'}), 'unicode') '.mph'];
```

```
model.result.create('pg4', 'PlotGroup2D');
model.result('pg4').run;
model.result('pg4').run;
model.result.remove('pg4');
model.result.create('pg4', 'PlotGroup1D');
model.result('pg4').run;
model.result('pg4').create('ptgr1', 'PointGraph');
model.result('pg4').feature('ptgr1').set('markerpos', 'datapoints');
model.result('pg4').feature('ptgr1').set('linewidth', 'preference');
model.result('pg4').run;
model.result('pg4').run;
```

```

model.study('std1').feature('frlin').set('plist', 'range(0.01,1000,100000)');

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('s1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'frlin');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').set('control', 'frlin');
model.sol('sol1').create('s1', 'Stationary');
model.sol('sol1').feature('s1').set('stol', 1.0E-4);
model.sol('sol1').feature('s1').create('p1', 'Parametric');
model.sol('sol1').feature('s1').feature.remove('pDef');
model.sol('sol1').feature('s1').feature('p1').set('pname', {'freq'});
model.sol('sol1').feature('s1').feature('p1').set('plistarr', {'range(0.01,1000,100000)'});
model.sol('sol1').feature('s1').feature('p1').set('punit', {'Hz'});
model.sol('sol1').feature('s1').feature('p1').set('pcontinuationmode', 'no');
model.sol('sol1').feature('s1').feature('p1').set('preusesol', 'no');
model.sol('sol1').feature('s1').feature('p1').set('pdistrib', 'off');
model.sol('sol1').feature('s1').feature('p1').set('plot', 'off');
model.sol('sol1').feature('s1').feature('p1').set('plotgroup', 'pg1');
model.sol('sol1').feature('s1').feature('p1').set('probesel', 'all');
model.sol('sol1').feature('s1').feature('p1').set('probes', {});
model.sol('sol1').feature('s1').feature('p1').set('control', 'frlin');
model.sol('sol1').feature('s1').set('nonlin', 'linper');
model.sol('sol1').feature('s1').set('storelinpoint', true);
model.sol('sol1').feature('s1').set('linpsolnum', 'all');
model.sol('sol1').feature('s1').set('control', 'frlin');
model.sol('sol1').feature('s1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('s1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}),
'unicode') native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').create('i1', 'Iterative');
model.sol('sol1').feature('s1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('s1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i1').create('mg1', 'Multigrid');

```

```

model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter',
1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsm
ethod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('s1').create('i2', 'Iterative');
model.sol('sol1').feature('s1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('s1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter',
1);
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsm
ethod', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');

```

```

model.sol('sol1').feature('s1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg4').run;
model.result('pg4').run;
model.result('pg4').feature('ptgr1').set('data', 'dset1');
model.result('pg4').feature('ptgr1').selection.all;
model.result('pg4').run;
model.result('pg4').feature('ptgr1').selection.set([5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22]);
model.result('pg4').run;
model.result('pg4').feature('ptgr1').set('autodescr', true);
model.result('pg4').feature('ptgr1').set('autoexpr', true);
model.result('pg4').feature('ptgr1').set('legend', true);
model.result('pg4').feature('ptgr1').set('autoplotlabel', true);
model.result('pg4').feature('ptgr1').set('autounit', true);
model.result('pg4').feature('ptgr1').selection.set([6 8 10 12 14 16 18 20 22]);
model.result('pg4').run;
model.result('pg4').feature('ptgr1').set('autoplotlabel', false);
model.result('pg4').run;
model.result('pg4').run;
model.result('pg4').label([native2unicode(hex2dec({'54' '04'}), 'unicode')
native2unicode(hex2dec({'5c' '42'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'67' '81'}), 'unicode') native2unicode(hex2dec({'75'
'35'}), 'unicode') native2unicode(hex2dec({'4f' '4d'}), 'unicode') ]);
model.result('pg4').set('xlog', true);
model.result.create('pg5', 'PlotGroup1D');
model.result('pg5').run;
model.result('pg5').create('ptgr1', 'PointGraph');
model.result('pg5').feature('ptgr1').set('markerpos', 'datapoints');
model.result('pg5').feature('ptgr1').set('linewidth', 'preference');
model.result('pg5').feature('ptgr1').set('expr', 'cd.nls');
model.result('pg5').feature('ptgr1').set('descr', [native2unicode(hex2dec({'6c' 'd5'}), 'unicode')
native2unicode(hex2dec({'54' '11'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'67' '81'}), 'unicode') native2unicode(hex2dec({'75'
'35'}), 'unicode') native2unicode(hex2dec({'6d' '41'}), 'unicode')
native2unicode(hex2dec({'5b' 'c6'}), 'unicode') native2unicode(hex2dec({'5e' 'a6'}),
'unicode') ]);
model.result.create('pg6', 'PlotGroup2D');
model.result('pg6').run;

```



```

model.result('pg6').create('surf1', 'Surface');
model.result('pg6').feature('surf1').set('expr', 'cd.lsMag');
model.result('pg6').feature('surf1').set('descr', [native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'67' '81'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'6d' '41'}), 'unicode') native2unicode(hex2dec({'5b'
'c6'}), 'unicode') native2unicode(hex2dec({'5e' 'a6'}), 'unicode')
native2unicode(hex2dec({'59' '27'}), 'unicode') native2unicode(hex2dec({'5c' '0f'}),
'unicode') ]]);
model.result('pg6').run;
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 5]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 5 7]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 5 7 9]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 7 9]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6 7 9]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6 7 8 9]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6 7 8 9 10]);
model.result('pg6').setIndex('looplevel', 99, 0);
model.result('pg6').setIndex('looplevel', 98, 0);
model.result('pg6').setIndex('looplevel', 97, 0);
model.result('pg6').setIndex('looplevel', 96, 0);
model.result('pg6').setIndex('looplevel', 95, 0);
model.result('pg6').setIndex('looplevel', 94, 0);
model.result('pg6').setIndex('looplevel', 93, 0);
model.result('pg6').setIndex('looplevel', 94, 0);
model.result('pg6').setIndex('looplevel', 95, 0);
model.result('pg6').setIndex('looplevel', 96, 0);
model.result('pg6').setIndex('looplevel', 95, 0);
model.result('pg6').setIndex('looplevel', 94, 0);
model.result('pg6').setIndex('looplevel', 93, 0);
model.result('pg6').setIndex('looplevel', 92, 0);
model.result('pg6').setIndex('looplevel', 91, 0);
model.result('pg6').setIndex('looplevel', 90, 0);
model.result('pg6').setIndex('looplevel', 89, 0);
model.result('pg6').setIndex('looplevel', 88, 0);

```

```

model.result('pg6').setIndex('looplevel', 87, 0);
model.result('pg6').setIndex('looplevel', 86, 0);
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').setIndex('looplevel', 2, 0);
model.result('pg6').run;
model.result('pg6').set('showlegendsmaxmin', true);
model.result.export.create('anim1', 'Animation');
model.result.export('anim1').set('target', 'player');
model.result.export('anim1').set('plotgroup', 'pg6');
model.result.export('anim1').run;
model.result.export('anim1').set('framesel', 'all');
model.result.export('anim1').showFrame;
model.result.export('anim1').set('maxframes', 100);
model.result.export('anim1').set('showframe', 88);
model.result.export('anim1').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').feature('surf1').create('def1', 'Deform');
model.result('pg6').run;
model.result('pg6').feature('surf1').feature('def1').set('scaleactive', true);
model.result('pg6').feature('surf1').feature.remove('def1');
model.result('pg6').run;
model.result('pg5').run;
model.result('pg6').run;
model.result.export.create('plot4', 'Plot');
model.result.export.remove('plot4');
model.result.export('anim1').showFrame;
model.result('pg5').run;
model.result.remove('pg5');
model.result('pg6').run;
model.result.export('anim1').showFrame;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg4').run;
model.result('pg6').run;
model.result('pg6').run;
model.result.export.create('plot4', 'pg6', 'surf1', 'Plot');

```

```

model.result.export('plot4').set('filename', ['C:\Users\lenovo\Desktop\'
native2unicode(hex2dec({'5c' '42'}), 'unicode') native2unicode(hex2dec({'53' 'e0'}),
'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'67'
'81'}), 'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'6d' '41'}), 'unicode') native2unicode(hex2dec({'5b' 'c6'}),
'unicode') native2unicode(hex2dec({'5e' 'a6'}), 'unicode') '.txt']);
model.result.export('plot4').run;
model.result.export('anim1').showFrame;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').selection.geom('geom1', 0);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6 7]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6 7 8]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6 7 8 9]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6 7 8 9 10]);
model.result('pg6').run;
model.result('pg6').setIndex('looplevel', 3, 0);
model.result('pg6').run;
model.result('pg6').setIndex('looplevel', 14, 0);
model.result('pg6').run;
model.result('pg6').setIndex('looplevel', 29, 0);
model.result('pg6').run;
model.result('pg6').run;
model.result('pg4').run;
model.result('pg6').run;
model.result('pg6').setIndex('looplevel', 1, 0);
model.result('pg6').run;
model.result('pg6').setIndex('looplevel', 14, 0);
model.result('pg6').run;
model.result.export('anim1').showFrame;

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```

model.result.export('anim1').run;
model.result('pg6').run;
model.result('pg6').setIndex('looplevel', 15, 0);
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').feature('surf1').set('expr', 'cd.lsMag');
model.result('pg6').feature('surf1').set('descr', [native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'67' '81'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'6d' '41'}), 'unicode') native2unicode(hex2dec({'5b'
'c6'}), 'unicode') native2unicode(hex2dec({'5e' 'a6'}), 'unicode')
native2unicode(hex2dec({'59' '27'}), 'unicode') native2unicode(hex2dec({'5c' '0f'}),
'unicode') ]]);
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').selection.geom('geom1');
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').run;
model.result('pg6').feature('surf1').set('expr', 'cd.lsMag');
model.result('pg6').feature('surf1').set('descr', [native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'67' '81'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'6d' '41'}), 'unicode') native2unicode(hex2dec({'5b'
'c6'}), 'unicode') native2unicode(hex2dec({'5e' 'a6'}), 'unicode')
native2unicode(hex2dec({'59' '27'}), 'unicode') native2unicode(hex2dec({'5c' '0f'}),
'unicode') ]]);
model.result('pg6').run;
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6 7]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6 7 8]);
model.result('pg6').selection.geom('geom1', 2);
model.result('pg6').selection.set([3 4 5 6 7 8 9]);
model.result('pg6').selection.geom('geom1', 2);

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```

model.result('pg6').selection.set([3 4 5 6 7 8 9 10]);

model.sol('sol1').study('std1');
model.sol('sol1').feature.remove('s1');
model.sol('sol1').feature.remove('v1');
model.sol('sol1').feature.remove('st1');
model.sol('sol1').create('st1', 'StudyStep');
model.sol('sol1').feature('st1').set('study', 'std1');
model.sol('sol1').feature('st1').set('studystep', 'fmlin');
model.sol('sol1').create('v1', 'Variables');
model.sol('sol1').feature('v1').set('control', 'fmlin');
model.sol('sol1').create('s1', 'Stationary');
model.sol('sol1').feature('s1').set('stol', 1.0E-4);
model.sol('sol1').feature('s1').create('p1', 'Parametric');
model.sol('sol1').feature('s1').feature.remove('pDef');
model.sol('sol1').feature('s1').feature('p1').set('pname', {'freq'});
model.sol('sol1').feature('s1').feature('p1').set('plistarr', {'range(0.01,1000,100000)'});
model.sol('sol1').feature('s1').feature('p1').set('punit', {'Hz'});
model.sol('sol1').feature('s1').feature('p1').set('pcontinuationmode', 'no');
model.sol('sol1').feature('s1').feature('p1').set('preusesol', 'no');
model.sol('sol1').feature('s1').feature('p1').set('pdistrib', 'off');
model.sol('sol1').feature('s1').feature('p1').set('plot', 'off');
model.sol('sol1').feature('s1').feature('p1').set('plotgroup', 'pg1');
model.sol('sol1').feature('s1').feature('p1').set('probesel', 'all');
model.sol('sol1').feature('s1').feature('p1').set('probes', {});
model.sol('sol1').feature('s1').feature('p1').set('control', 'fmlin');
model.sol('sol1').feature('s1').set('nonlin', 'linper');
model.sol('sol1').feature('s1').set('storelinpoint', true);
model.sol('sol1').feature('s1').set('linpsolnum', 'all');
model.sol('sol1').feature('s1').set('control', 'fmlin');
model.sol('sol1').feature('s1').create('fc1', 'FullyCoupled');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('d1').set('linsolver', 'pardiso');
model.sol('sol1').feature('s1').feature('d1').label([native2unicode(hex2dec({'76' 'f4'}),
'unicode') native2unicode(hex2dec({'63' 'a5'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').create('i1', 'Iterative');
model.sol('sol1').feature('s1').feature('i1').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i1').set('nlinnormuse', 'on');
model.sol('sol1').feature('s1').feature('i1').label([native2unicode(hex2dec({'4e' 'e3'}), 'unicode')
native2unicode(hex2dec({'65' '70'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i1').create('mg1', 'Multigrid');

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model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('prefun', 'saamg');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('maxcoarsedof', 50000);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('saamgcompwise', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').set('compactaggregation', true);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('iter',
1);
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('po').feature('sc1').set('scgsm
ethod', 'lines');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i1').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');
model.sol('sol1').feature('s1').create('i2', 'Iterative');
model.sol('sol1').feature('s1').feature('i2').set('maxlinit', 1000);
model.sol('sol1').feature('s1').feature('i2').set('nlinnormuse', 'on');
model.sol('sol1').feature('s1').feature('i2').label([native2unicode(hex2dec({'51' 'e0'}), 'unicode')
native2unicode(hex2dec({'4f' '55'}), 'unicode') native2unicode(hex2dec({'59' '1a'}),
'unicode') native2unicode(hex2dec({'91' 'cd'}), 'unicode') native2unicode(hex2dec({'7f'
'51'}), 'unicode') native2unicode(hex2dec({'68' '3c'}), 'unicode') ' (cd)']);
model.sol('sol1').feature('s1').feature('i2').create('mg1', 'Multigrid');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('iter', 1);
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('pr').feature('sc1').set('scgsme
thod', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').create('sc1', 'SCGS');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('lineswe
eptype', 'ssor');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('iter',
1);
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('po').feature('sc1').set('scgsm
ethod', 'lines');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').create('d1', 'Direct');
model.sol('sol1').feature('s1').feature('i2').feature('mg1').feature('cs').feature('d1').set('linsolver
', 'pardiso');

```

```

model.sol('sol1').feature('s1').feature('fc1').set('linsolver', 'd1');
model.sol('sol1').feature('s1').feature('fc1').set('dtech', 'auto');
model.sol('sol1').feature('s1').feature.remove('fcDef');
model.sol('sol1').attach('std1');
model.sol('sol1').runAll;

model.result('pg1').run;
model.result('pg6').run;
model.result('pg6').feature('surf1').set('data', 'dset1');
model.result('pg6').run;
model.result('pg6').feature('surf1').setIndex('looplevel', 89, 0);
model.result('pg6').run;
model.result('pg6').feature('surf1').setIndex('looplevel', 7, 0);
model.result('pg6').run;
model.result('pg6').feature('surf1').setIndex('looplevel', 14, 0);
model.result('pg6').run;
model.result('pg6').feature('surf1').setIndex('looplevel', 27, 0);
model.result('pg6').run;
model.result('pg6').feature('surf1').setIndex('looplevel', 40, 0);
model.result('pg6').run;
model.result('pg6').feature('surf1').setIndex('looplevel', 55, 0);
model.result('pg6').run;
model.result('pg6').feature('surf1').setIndex('looplevel', 66, 0);
model.result('pg6').run;
model.result('pg6').feature('surf1').setIndex('looplevel', 81, 0);
model.result('pg6').feature('surf1').setIndex('looplevel', 98, 0);
model.result('pg6').run;
model.result('pg6').feature('surf1').setIndex('looplevel', 100, 0);
model.result('pg6').run;
model.result('pg6').feature('surf1').setIndex('looplevel', 1, 0);
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').create('mms1', 'MaxMinSurface');
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').feature('mms1').set('data', 'parent');
model.result('pg6').feature('mms1').set('expr', 'cd.lsMag');
model.result('pg6').feature('mms1').set('descr', [native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'67' '81'}), 'unicode') native2unicode(hex2dec({'75'
'35'}), 'unicode') native2unicode(hex2dec({'6d' '41'}), 'unicode')
native2unicode(hex2dec({'5b' 'c6'}), 'unicode') native2unicode(hex2dec({'5e' 'a6'}),
'unicode') native2unicode(hex2dec({'59' '27'}), 'unicode') native2unicode(hex2dec({'5c'
'0f'}), 'unicode') ]]);
model.result('pg6').feature('mms1').set('display', 'max');

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```

model.result('pg6').run;
model.result('pg6').feature('mms1').set('color', 'white');
model.result('pg6').feature('mms1').set('display', 'min');
model.result('pg6').run;
model.result('pg6').feature('mms1').set('color', 'black');
model.result('pg6').run;
model.result('pg6').set('lastinputmode', 'evaluate');
model.result('pg6').set('inputmode', 'linefirst');
model.result('pg6').set('lastinputmode', 'linefirst');
model.result('pg6').set('inputmode', 'evaluate');
model.result('pg6').run;
model.result('pg6').set('lastinputmode', 'evaluate');
model.result('pg6').set('inputmode', 'linefirst');
model.result('pg6').set('lastinputmode', 'linefirst');
model.result('pg6').set('inputmode', 'evaluate');
model.result('pg6').run;
model.result('pg6').set('lastinputmode', 'evaluate');
model.result('pg6').set('inputmode', 'linefirst');
model.result('pg6').run;
model.result('pg6').set('linefirst', [2.364762544631958 7.902634143829346 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.36476 7.90263; 4.01499 10]);
model.result('pg6').set('cutlinedshash', -1161117453);
model.result('pg7').set('data', 'cln1');
model.result('pg6').set('cutlinepgds', 'cln1');
model.result('pg6').run;
model.result('pg6').set('lastinputmode', 'linefirst');
model.result('pg6').set('inputmode', 'linessecond');
model.result('pg6').set('lastinputmode', 'linessecond');
model.result('pg6').set('inputmode', 'evaluate');
model.result('pg6').run;
model.result('pg6').set('lastinputmode', 'evaluate');
model.result('pg6').set('inputmode', 'linessecond');
model.result('pg6').set('linessecond', [2.6056361198425293 8.21960735321045 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.36476 7.90263; 2.60564 8.2196]);
model.result('pg6').set('cutlinedshash', -530416798);
model.result('pg7').set('data', 'cln1');
model.result('pg6').set('cutlinepgds', 'cln1');
model.result('pg6').set('linessecond', [2.4276676177978516 7.920619964599609 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.36476 7.90263; 2.42767 7.92062]);
model.result('pg6').set('cutlinedshash', -14399021);
model.result('pg7').set('data', 'cln1');

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model.result('pg6').set('cutlinepgds', 'cln1');
model.result('pg6').set('linesecnd', [2.392073631286621 7.920619964599609 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.36476 7.90263; 2.39208 7.92062]);
model.result('pg6').set('cutlinedshash', 2052293741);
model.result('pg7').set('data', 'cln1');
model.result('pg6').set('cutlinepgds', 'cln1');
model.result('pg6').set('linesecnd', [2.449023723602295 7.813838958740234 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.36476 7.90263; 2.44903 7.81383]);
model.result('pg6').set('cutlinedshash', 677138679);
model.result('pg7').set('data', 'cln1');
model.result('pg6').set('cutlinepgds', 'cln1');
model.result('pg6').set('linesecnd', [2.3991923332214355 7.756889343261719 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.36476 7.90263; 2.3992 7.75689]);
model.result('pg6').set('cutlinedshash', -1761613870);
model.result('pg7').set('data', 'cln1');
model.result('pg6').set('cutlinepgds', 'cln1');
model.result('pg6').set('linesecnd', [2.40631103515625 7.749770164489746 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.36476 7.90263; 2.40632 7.74976]);
model.result('pg6').set('cutlinedshash', -376519910);
model.result('pg7').set('data', 'cln1');
model.result('pg6').set('cutlinepgds', 'cln1');
model.result('pg6').set('linesecnd', [5.018889427185059 7.95621395111084 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.36476 7.90263; 5.01888 7.95619]);
model.result('pg6').set('cutlinedshash', 1893645762);
model.result('pg7').set('data', 'cln1');
model.result('pg6').set('cutlinepgds', 'cln1');
model.result('pg6').set('linesecnd', [5.8359880447387695 7.897374153137207 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.36476 7.90263; 5.836 7.89735]);
model.result('pg6').set('cutlinedshash', -1294255108);
model.result('pg7').set('data', 'cln1');
model.result('pg6').set('cutlinepgds', 'cln1');
model.result('pg6').set('lastinputmode', 'linesecnd');
model.result('pg6').set('inputmode', 'evaluate');

model.component('comp1').geom('geom1').run('r13');
model.component('comp1').geom('geom1').create('sca1', 'Scale');
model.component('comp1').geom('geom1').feature('sca1').selection('input').set({r3 'r5' 'r7'
'r9'});

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model.component('comp1').geom('geom1').feature('sca1').set('isotropic', 0.05);
model.component('comp1').geom('geom1').run('sca1');
model.component('comp1').geom('geom1').feature('sca1').set('isotropic', 0.5);
model.component('comp1').geom('geom1').run('sca1');
model.component('comp1').geom('geom1').feature.remove('sca1');
model.component('comp1').geom('geom1').run('fin');
model.component('comp1').geom('geom1').run('fin');

model.result('pg6').run;

model.component('comp1').probe.create('pdom1', 'DomainPoint');
model.component('comp1').probe('pdom1').set('coords', [3.0051701 9.9535121]);
model.component('comp1').probe('pdom1').setIndex('coords2', 9.9, 1);
model.component('comp1').probe('pdom1').setIndex('coords2', 3.005, 0);
model.component('comp1').probe.create('pdom2', 'DomainPoint');
model.component('comp1').probe('pdom2').setIndex('coords2', 9.9, 1);
model.component('comp1').probe('pdom2').setIndex('coords2', 3.3, 0);
model.component('comp1').probe.create('pdom3', 'DomainPoint');
model.component('comp1').probe('pdom3').set('coords', [3.5150913 9.9166306]);
model.component('comp1').probe('pdom3').setIndex('coords2', 9.9, 1);
model.component('comp1').probe('pdom3').setIndex('coords2', 3.515, 0);
model.component('comp1').probe.create('pdom4', 'DomainPoint');
model.component('comp1').probe('pdom4').set('coords', [3.7673921 9.9781026]);
model.component('comp1').probe('pdom4').setIndex('coords2', 3.8, 0);
model.component('comp1').probe('pdom4').setIndex('coords2', 9.9, 1);
model.component('comp1').probe('pdom4').set('coords', [3.4076676 10.1790781]);
model.component('comp1').probe('pdom4').setIndex('coords2', 3.8, 0);
model.component('comp1').probe('pdom4').setIndex('coords2', 9.9, 1);
model.component('comp1').probe.create('pdom5', 'DomainPoint');
model.component('comp1').probe('pdom5').set('coords', [4.0250254 9.982914]);
model.component('comp1').probe('pdom5').setIndex('coords2', 4.025, 0);
model.component('comp1').probe('pdom5').setIndex('coords2', 9.9, 1);
model.component('comp1').probe.create('pdom6', 'DomainPoint');
model.component('comp1').probe('pdom6').set('coords', [4.2628875 9.9417619]);
model.component('comp1').probe('pdom6').setIndex('coords2', 4.26, 0);
model.component('comp1').probe('pdom6').setIndex('coords2', 9.9, 1);
model.component('comp1').probe.create('pdom7', 'DomainPoint');
model.component('comp1').probe('pdom7').set('coords', [4.5253309 9.9855919]);
model.component('comp1').probe('pdom7').setIndex('coords2', 4.525, 0);
model.component('comp1').probe('pdom7').setIndex('coords2', 9.9, 1);
model.component('comp1').probe.create('pdom8', 'DomainPoint');
model.component('comp1').probe('pdom8').set('coords', [4.7770829 9.9455042]);
model.component('comp1').probe('pdom8').setIndex('coords2', 4.755, 0);
model.component('comp1').probe('pdom8').setIndex('coords2', 9.9, 1);

```

```

model.result.create('pg8', 'PlotGroup1D');
model.result('pg8').run;
model.result('pg8').create('Ingr1', 'LineGraph');
model.result('pg8').feature('Ingr1').set('markerpos', 'datapoints');
model.result('pg8').feature('Ingr1').set('linewidth', 'preference');
model.result('pg8').feature('Ingr1').set('data', 'dset1');
model.result('pg8').run;
model.result('pg8').run;
model.result.remove('pg8');
model.result('pg1').set('windowtitle', [native2unicode(hex2dec({'56' 'fe'}), 'unicode')
native2unicode(hex2dec({'5f' '62'}), 'unicode') ]]);
model.result('pg2').set('windowtitle', [native2unicode(hex2dec({'56' 'fe'}), 'unicode')
native2unicode(hex2dec({'5f' '62'}), 'unicode') ]]);
model.result('pg4').set('windowtitle', [native2unicode(hex2dec({'56' 'fe'}), 'unicode')
native2unicode(hex2dec({'5f' '62'}), 'unicode') ]]);
model.result('pg3').set('windowtitle', [native2unicode(hex2dec({'56' 'fe'}), 'unicode')
native2unicode(hex2dec({'5f' '62'}), 'unicode') ]]);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').run;
model.result('pg6').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').run;

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model.result('pg7').feature('lngr1').set('xdata', 'spacevar');
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').run;
model.result('pg7').feature('lngr1').set('cutline', 'cln1');
model.result('pg7').feature('lngr1').set('linefirst', [2.515000104904175 0 0]);
model.result('pg7').feature('lngr1').set('linessecond', [2.515000104904175 10 0]);
model.result('pg7').feature('lngr1').set('lineisinit', true);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.515 0; 2.515 10]);
model.result('pg7').feature('lngr1').set('cutmode', true);
model.result('pg7').feature('lngr1').set('inputmode', 'linefirst');
model.result('pg7').feature('lngr1').set('linefirst', [2.5017175674438477 8.286520004272461 -
1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.50172 8.28651; 2.515 10]);
model.result('pg7').feature('lngr1').set('inputmode', 'linessecond');
model.result('pg7').feature('lngr1').set('linessecond', [5.032431602478027 8.41999626159668
-1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.50172 8.28651; 5.03242 8.42]);
model.result('pg7').feature('lngr1').set('linessecond', [5.027092456817627
8.339910507202148 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.50172 8.28651; 5.02709 8.3399]);
model.result('pg7').feature('lngr1').set('linessecond', [5.027092456817627
8.238469123840332 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.50172 8.28651; 5.02709 8.23846]);
model.result('pg7').feature('lngr1').set('linessecond', [2.539091110229492
9.477130889892578 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.50172 8.28651; 2.53907 9.47713]);
model.result('pg7').feature('lngr1').set('linessecond', [5.027092456817627
9.658658981323242 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.50172 8.28651; 5.02709 9.65867]);
model.result('pg7').feature('lngr1').set('inputmode', 'linefirst');
model.result('pg7').feature('lngr1').set('linefirst', [2.432309627532959 9.514504432678223 -
1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.43231 9.5145; 5.02709 9.65867]);

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model.result('pg7').feature('lngr1').set('linefirst', [2.44832706451416 9.71204948425293 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.44831 9.71204; 5.02709 9.65867]);
model.result('pg7').feature('lngr1').set('linefirst', [2.4857001304626465 9.599928855895996 -
1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.4857 9.59993; 5.02709 9.65867]);
model.result('pg7').feature('lngr1').set('linefirst', [2.9982500076293945 9.605268478393555 -
1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.99825 9.60527; 5.02709 9.65867]);
model.result('pg7').feature('lngr1').set('linefirst', [3.0028645992279053 9.831656455993652 -
1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [3.00286 9.83167; 5.02709 9.65867]);
model.result('pg7').feature('lngr1').set('inputmode', 'linessecond');
model.result('pg7').feature('lngr1').set('linessecond', [5.031304836273193
9.827858924865723 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [3.00286 9.83167; 5.03129 9.82787]);
model.result('pg7').feature('lngr1').set('linessecond', [4.812116622924805
9.832926750183105 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [3.00286 9.83167; 4.81212 9.83294]);
model.result('pg7').feature('lngr1').set('inputmode', 'linefirst');
model.result('pg7').feature('lngr1').set('linefirst', [3.0055737495422363 9.831626892089844 -
1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [3.00557 9.83163; 4.81212 9.83294]);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').feature('lngr1').set('cutmode', 'off');
model.result('pg7').run;
model.result('pg7').feature('lngr1').set('xdata', 'expr');
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').run;
model.result('pg7').set('window', 'window2');

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model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg6').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').feature('Ingr1').set('xdata', 'arc');
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').feature('Ingr1').set('linewidthslider', 10);
model.result('pg7').feature('Ingr1').set('autoplotlabel', true);
model.result('pg7').feature('Ingr1').set('autodescr', true);
model.result('pg7').feature('Ingr1').set('autoexpr', true);
model.result('pg7').feature('Ingr1').set('autounit', true);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').feature('Ingr1').set('linewidth', 10);
model.result('pg7').feature('Ingr1').set('linewidthslider', 1);
model.result('pg7').feature('Ingr1').set('linecolor', 'cycle');
model.result('pg7').set('window', 'window2');

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model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result.export.create('plot5', 'pg7', 'Ingr1', 'Plot');
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg6').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg6').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').label([native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'6d' '41'}), 'unicode') native2unicode(hex2dec({'5b' 'c6'}),
'unicode') native2unicode(hex2dec({'5e' 'a6'}), 'unicode') ]);
model.result('pg7').set('xlog', true);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').set('xlog', false);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').set('manualgrid', true);
model.result('pg7').set('xspacing', 0.5);

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model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').set('xspacing', 1);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').set('showgrid', false);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').set('showgrid', true);
model.result('pg7').set('manualgrid', false);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result.export('plot5').label([native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'6d' '41'}), 'unicode') native2unicode(hex2dec({'5b' 'c6'}),
'unicode') native2unicode(hex2dec({'5e' 'a6'}), 'unicode') ]);
model.result.export('plot5').set('filename', ['C:\Users\lenovo\Desktop\'
native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'6d' '41'}),
'unicode') native2unicode(hex2dec({'5b' 'c6'}), 'unicode') native2unicode(hex2dec({'5e'
'a6'}), 'unicode') '.txt']);
model.result.export('plot5').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').feature('lngr1').set('cutline', 'cln1');
model.result.dataset('cln1').set('method', 'twopoint');

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model.result.dataset('cln1').set('genpoints', [3.00557 9.83163; 4.81212 9.83294]);
model.result('pg7').feature('lngr1').set('cutmode', true);
model.result('pg7').feature('lngr1').set('linefirst', [3.0007433891296387 9.83261775970459 -
1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [3.00075 9.83262; 4.81212 9.83294]);
model.result('pg7').feature('lngr1').set('linefirst', [2.9989287853240967 9.962366104125977 -
1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.99893 9.96237; 4.81212 9.83294]);
model.result('pg7').feature('lngr1').set('inputmode', 'linesecnd');
model.result('pg7').feature('lngr1').set('linesecnd', [5.024212837219238
9.937898635864258 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.99893 9.96237; 5.02421 9.9379]);
model.result('pg7').feature('lngr1').set('linesecnd', [5.030970573425293
9.968306541442871 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.99893 9.96237; 5.03096 9.96831]);
model.result('pg7').feature('lngr1').set('linesecnd', [5.030970573425293
9.961548805236816 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.99893 9.96237; 5.03096 9.96155]);
model.result('pg7').feature('lngr1').set('linesecnd', [5.150911331176758
9.993645668029785 -1]);
model.result.dataset('cln1').set('method', 'twopoint');
model.result.dataset('cln1').set('genpoints', [2.99893 9.96237; 5.1509 9.99365]);
model.result('pg7').feature('lngr1').set('cutmode', false);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result.export('plot5').run;
model.result('pg4').run;
model.result('pg4').set('showlegends', false);
model.result('pg4').set('xlog', false);
model.result('pg6').feature('mms1').active(false);
model.result('pg6').feature('mms1').active(true);
model.result('pg6').feature('mms1').active(false);
model.result('pg6').feature('mms1').active(true);
model.result('pg4').run;
model.result('pg4').run;
model.result.export.create('plot6', 'pg4', 'ptgr1', 'Plot');

```

```

model.result.export('plot6').label([native2unicode(hex2dec({'54' '04'}), 'unicode')
native2unicode(hex2dec({'5c' '42'}), 'unicode') native2unicode(hex2dec({'75' '35'}),
'unicode') native2unicode(hex2dec({'67' '81'}), 'unicode') native2unicode(hex2dec({'75'
'35'}), 'unicode') native2unicode(hex2dec({'4f' '4d'}), 'unicode') ]);
model.result.export('plot6').set('filename', ['C:\Users\lenovo\Desktop\'
native2unicode(hex2dec({'54' '04'}), 'unicode') native2unicode(hex2dec({'5c' '42'}),
'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode') native2unicode(hex2dec({'67'
'81'}), 'unicode') native2unicode(hex2dec({'75' '35'}), 'unicode')
native2unicode(hex2dec({'4f' '4d'}), 'unicode') '.txt']);
model.result.export('plot6').run;
model.result('pg4').run;
model.result('pg6').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').feature('Ingr1').set('linewidthslider', 4);
model.result('pg7').feature('Ingr1').set('legend', true);
model.result('pg7').feature('Ingr1').set('autoexpr', false);
model.result('pg7').feature('Ingr1').set('autounit', false);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').feature('Ingr1').set('autodescr', false);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').feature('Ingr1').set('autosolution', false);
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]);
model.result('pg7').run;
model.result('pg7').feature('Ingr1').set('autoplotlabel', false);
model.result('pg7').feature('Ingr1').set('linecolor', 'custom');
model.result('pg7').feature('Ingr1').set('customlinecolor', [0.03921568766236305
0.003921568859368563 0.01568627543747425]);
model.result('pg7').feature('Ingr1').set('linecolor', 'cycle');
model.result('pg7').feature('Ingr1').set('legend', false);

```

```

model.result('pg7').feature('lngr1').set('resolution', 'finer');
model.result('pg7').feature('lngr1').set('legendexprprecision', 10);
model.result('pg7').feature('lngr1').set('titletype', 'none');
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').run;
model.result('pg7').set('xlabelactive', true);
model.result('pg7').set('xlabel', ['Stacked electrode (' native2unicode(hex2dec({'00' 'b5'}),
'unicode') 'm)']);
model.result('pg7').set('ylabelactive', true);
model.result('pg7').set('ylabel', 'Electrode current density (A/m<sup>2</sup>));
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').run;
model.result('pg4').run;
model.result('pg4').run;
model.result('pg4').set('xlabelactive', true);
model.result('pg4').set('ylabelactive', true);
model.result('pg4').set('ylabel', 'Electrolyte potential (V));
model.result('pg4').run;
model.result('pg4').feature('ptgr1').set('linewidth', 5);
model.result('pg4').feature('ptgr1').set('linewidthslider', 4);
model.result('pg4').run;
model.result('pg4').run;
model.result('pg4').feature('ptgr1').setIndex('looplevelinput', 'first', 0);
model.result('pg4').run;
model.result('pg4').feature('ptgr1').setIndex('looplevelinput', 'all', 0);
model.result('pg4').run;
model.result('pg4').set('showlegends', true);
model.result('pg4').set('ylog', false);
model.result('pg4').feature('ptgr1').set('legendmethod', 'manual');
model.result('pg4').feature('ptgr1').setIndex('legends', 1, 0);
model.result('pg4').feature('ptgr1').setIndex('legends', 2, 1);
model.result('pg4').feature('ptgr1').setIndex('legends', 3, 2);
model.result('pg4').feature('ptgr1').setIndex('legends', 4, 3);
model.result('pg4').feature('ptgr1').setIndex('legends', 5, 4);
model.result('pg4').feature('ptgr1').setIndex('legends', 6, 5);
model.result('pg4').feature('ptgr1').setIndex('legends', 7, 6);
model.result('pg4').feature('ptgr1').setIndex('legends', 8, 7);
model.result('pg4').feature('ptgr1').setIndex('legends', 9, 8);

```

```

model.result('pg4').feature('ptgr1').set('linecolor', 'cyclereset');
model.result('pg4').run;
model.result('pg4').feature('ptgr1').set('colorcycle', 'long');
model.result('pg4').feature('ptgr1').set('linecolor', 'cycle');
model.result('pg4').run;
model.result('pg4').run;
model.result('pg4').set('legendpos', 'manual');
model.result('pg4').set('axisactive', true);
model.result('pg4').set('axistrailingzeros', true);
model.result('pg4').set('axisactive', false);
model.result('pg4').run;
model.result('pg4').set('legendposy', 0.5);
model.result('pg4').run;
model.result('pg4').set('legendposx', 0.8);
model.result('pg4').run;
model.result('pg4').set('legendposy', 0.8);
model.result('pg4').run;
model.result('pg4').set('legendposy', 0.7);
model.result('pg4').run;
model.result('pg4').set('xlog', false);
model.result('pg4').set('preserveaspect', false);
model.result('pg4').set('legendposx', 0.9);
model.result('pg4').run;
model.result('pg4').run;
model.result('pg4').feature('ptgr1').set('linewidthslider', 5);
model.result('pg4').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').run;
model.result('pg4').run;
model.result('pg4').feature('ptgr1').set('linemarker', 'cycle');
model.result('pg4').feature('ptgr1').set('markerpos', 'interp');
model.result('pg4').feature('ptgr1').set('markers', 2);
model.result('pg4').feature('ptgr1').set('linemarker', 'cyclereset');
model.result('pg4').run;
model.result('pg4').feature('ptgr1').set('linemarker', 'cyclereset');
model.result('pg4').run;
model.result('pg7').set('window', 'window2');
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);
model.result('pg7').run;

```

```
model.label('The simulation of interface characteristics and charge transfer dynamics for  
layered electrodes using cascade capacitance in supercapacitors by COMSOL  
software.mph');
```

```
model.result('pg7').set('window', 'window2');  
model.result('pg7').set('windowtitle', [native2unicode(hex2dec({'7e' 'd8'}), 'unicode')  
native2unicode(hex2dec({'56' 'fe'}), 'unicode') native2unicode(hex2dec({'20' '1c'}),  
'unicode') '2' native2unicode(hex2dec({'20' '1d'}), 'unicode') ]]);  
model.result('pg7').run;
```

```
out = model;
```