

## 1 Variables

### 2 root

	var	symbol	documentation	type	units	tokens	eqs
1	$F_{N,A}$	<b>F</b>	incidence matrix of directed graph	network		[]	
2	$t$	<b>t</b>	time	frame	$s$	[]	
3	$\#$	<b>value</b>	numerical value	constant		[]	
4	1	<b>one</b>	numerical value 1	constant		[]	1
5	0	<b>zero</b>	numerical value 0	constant		[]	2
6	1/2	<b>onehalf</b>	numerical value 1/2	constant		[]	3

### 3 physical

	var	symbol	documentation	type	units	tokens	eqs
10	$F_{NS,AS}$	<b>F_NS_AS</b>	blick incidence matrix of directed species graph	network		[]	6
9	$P_{NS,AS}$	<b>P_NS_AS</b>	node species to arc species projection	projection		[]	
11	$P_{K,NK}$	<b>P_K_NK</b>	projection of conversion to node x conversion	projection		[]	
12	$P_{NS,KS}$	<b>P_NS_KS</b>	projection node x species to conversion x species	projection		[]	
13	$P_{N,NK}$	<b>P_N_NK</b>	projection node to node x conversion	projection		[]	
14	$P_{NK,KS}$	<b>P_NK_KS</b>	projection node x conversion to conversion x species	projection		[]	
15	$r_{xN}$	<b>r_x</b>	x-coordinate	frame	$m$	[]	
16	$r_{yN}$	<b>r_y</b>	y-coordinate	frame	$m$	[]	
17	$r_{zN}$	<b>r_z</b>	z-coordinate	frame	$m$	[]	

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	var	symbol	documentation	type	units	tokens	eqs
18	$n_{NS}$	n	foundation state – species mass	state	$mol$	['mass']	
19	$U_N$	U	foundation state – internal energy	state	$kg\,m^2\,s^{-2}$	['energy']	
20	$S_N$	S	foundation state – entropy	state	$kg\,m^2\,K^{-1}\,s^{-2}$	[]	
21	$V_N$	V	foundation state – volume	state	$m^3$	[]	
29	$H_N$	H	enthalpy	state	$kg\,m^2\,s^{-2}$	['energy']	13
30	$A_N$	A	Helmholtz energy	state	$kg\,m^2\,s^{-2}$	['energy']	14
31	$G_N$	G	Gibbs energy	state	$kg\,m^2\,s^{-2}$	['energy']	15
26	$N^o$	No	Avogadro number	constant		[]	10
27	$B_N$	B	Boltzmann constant	constant	$kg\,m^2\,K^{-1}\,s^{-2}$	[]	11
28	$R_N$	R	gas constant	constant	$kg\,m^2\,K^{-1}\,s^{-2}$	[]	12
22	$p_N$	p	thermodynamic pressure	effort	$kg\,m^{-1}\,s^{-2}$	['energy']	7
23	$T_N$	T	temperature	effort	$K$	['energy']	8
24	$\mu_{NS}$	mu	chemical potential	effort	$kg\,m^2\,mol^{-1}\,s^{-2}$	['energy', 'mass']	9
36	$v_{xN}$	v_x	velocity in x-direction	seconaryState	$ms^{-1}$	[]	20
37	$v_{yN}$	v_y	velocity in y-direction	seconaryState	$ms^{-1}$	[]	21
38	$v_{zN}$	v_z	velocity in z-direction	seconaryState	$ms^{-1}$	[]	22
39	$v_N$	v	velocity vector	seconaryState	$ms^{-1}$	[]	23

## 4 control

	var	symbol	documentation	type	units	tokens	eqs
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## 5 reactions

	var	symbol	documentation	type	units	tokens	eqs
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## 6 material

	var	symbol	documentation	type	units	tokens	eqs
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## 7 macroscopic

	var	symbol	documentation	type	units	tokens	eqs
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## 8 solid

	var	symbol	documentation	type	units	tokens	eqs
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## 9 fluid

	var	symbol	documentation	type	units	tokens	eqs
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## 10 liquid

	var	symbol	documentation	type	units	tokens	eqs
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## 11 gas

	var	symbol	documentation	type	units	tokens	eqs
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## 12 control-reactions

	var	symbol	documentation	type	units	tokens	eqs
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## 13 reactions-control

	var	symbol	documentation	type	units	tokens	eqs
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## 14 control-material

	var	symbol	documentation	type	units	tokens	eqs
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## 15 material-control

	var	symbol	documentation	type	units	tokens	eqs
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## 16 control-macroscopic

	var	symbol	documentation	type	units	tokens	eqs
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## 17 macroscopic-control

	var	symbol	documentation	type	units	tokens	eqs
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## 18 reactions–material

	var	symbol	documentation	type	units	tokens	eqs
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## 19 material–reactions

	var	symbol	documentation	type	units	tokens	eqs
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## 20 reactions–macroscopic

	var	symbol	documentation	type	units	tokens	eqs
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## 21 macroscopic–reactions

	var	symbol	documentation	type	units	tokens	eqs
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## 22 material–macroscopic

	var	symbol	documentation	type	units	tokens	eqs
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## 23 macroscopic–material

	var	symbol	documentation	type	units	tokens	eqs
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## 24 gas–liquid

	var	symbol	documentation	type	units	tokens	eqs
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## 25 gas–solid

	var	symbol	documentation	type	units	tokens	eqs
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## 26 liquid–solid

	var	symbol	documentation	type	units	tokens	eqs
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## 27 Equations

### 27.1 Model equations

no	equation	documentation	layer
1	$1 := Set(\#, \#)$	numerical value 1	root
2	$0 := Set(\#, \#)$	numerical value 1	root
3	$1/2 := Set(\#, \#)$	numerical value 1/2	root
6	$F_{NS,AS} := F_{N,A} \odot P_{NS,AS}$	blick incidence matrix of directed species graph	physical
7	$p_N := \frac{\partial U_N}{\partial V_N}$	thermodynamic pressure	physical
8	$T_N := \frac{\partial U_N}{\partial S_N}$	temperature	physical
9	$\mu_{NS} := \frac{\partial U_N}{\partial n_{NS}}$	chemical potential	physical
10	$N^o := Set(\#, \#)$	Avogadro number	physical
11	$B_N := Set(S_N, \#)$	Boltzmann constant	physical
12	$R_N := B_N \cdot N^o$	gas constant	physical
13	$H_N := U_N + p_N \cdot V_N$	enthalpy	physical
14	$A_N := U_N - T_N \cdot S_N$	Helmholtz energy	physical
15	$G_N := U_N + p_N \cdot V_N - T_N \cdot S_N$	Gibbs energy	physical
20	$v_{xN} := \frac{\partial r_{xN}}{\partial t}$	velocity in x-direction	physical
21	$v_{yN} := \frac{\partial r_{yN}}{\partial t}$	velocity in y-direction	physical

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no	equation	documentation	layer
22	$v_{zN} := \frac{\partial r_{zN}}{\partial t}$	velocity in z-direction	physical
23	$v_N := Stack(v_{xN}, v_{yN}, v_{zN})$	velocity vector	physical