# Package 'geofluidprop'

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**Version** 1.3

**Type** Package

**Title** R wrapper for the geofluidprop library

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**Description** An R wrapper for the geofluidprop library for computing physical properties of geological fluids.

**License** GPL (>= 3)

**URL** https://github.com/aist-rerc-geothermal/geofluidprop-R

**Depends** R (>= 3.0.0)

**Imports** dplyr,
ggplot2,
rlang

**RoxygenNote** 7.2.2

**Encoding** UTF-8

**Suggests** testthat,
knitr,
rmarkdown,

**VignetteBuilder** knitr

## R topics documented:

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`bulk_ec_Archie` *Bulk electrical conductivity of fluid-solid mixtures based on Archie's law*

---

## Description

Bulk electrical conductivity of fluid-solid mixtures based on Archie's law

## Usage

```
bulk_ec_Archie(phi, sigma_f, m, a = 1)
```

## Arguments

| | |
|---|---|
| `phi` | porosity [-] |
| `sigma_f` | fluid electrical conductivity [S/m] |
| `m` | cementation exponent [-] |
| `a` | tortuosity factor [-] |

## Value

bulk electrical conductivity [S/m]

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`bulk_ec_HSupper` *Bulk electrical conductivity of fluid-solid mixtures from Hashin-Shtrikman upper bound*

---

## Description

Bulk electrical conductivity of fluid-solid mixtures from Hashin-Shtrikman upper bound

## Usage

```
bulk_ec_HSupper(phi, sigma_f, sigma_s)
```

### Arguments

| | |
|---|---|
| phi | porosity [-] |
| sigma_f | fluid electrical conductivity [S/m] |
| sigma_s | Solid electrical conductivity [S/m] |

### Value

bulk electrical conductivity [S/m]

---

## bulk_ec_ModifiedArchie

*Bulk electrical conductivity of fluid-solid mixtures based on modified Archie's law*

---

### Description

Bulk electrical conductivity of fluid-solid mixtures based on modified Archie's law

### Usage

```
bulk_ec_ModifiedArchie(phi, sigma_f, sigma_s, m)
```

### Arguments

| | |
|---|---|
| phi | porosity [-] |
| sigma_f | fluid electrical conductivity [S/m] |
| sigma_s | Solid electrical conductivity [S/m] |
| m | cementation exponent [-] |

### Value

bulk electrical conductivity [S/m]

## driesner07_H2O_NaCl_estimate_density_from_M0

*Estimate density from concentration*

### Description

Estimate density from concentration

### Usage

```
driesner07_H2O_NaCl_estimate_density_from_M0(M0)
```

### Arguments

| | |
|---|---|
| M0 | Molar concentration at room temperature [mol/L] |

### Value

density [kg/m3]

## driesner07_H2O_NaCl_get_phase_relation_on_Tp_space

*get information about H2O-NaCl phase relation at the given NaCl mass fraction, based on Driesner & Heinrich (2007)*

### Description

get information about H2O-NaCl phase relation at the given NaCl mass fraction, based on Driesner & Heinrich (2007)

### Usage

```
driesner07_H2O_NaCl_get_phase_relation_on_Tp_space(massfrac_NaCl, TC_max = 800)
```

### Arguments

| | |
|---|---|
| massfrac_NaCl | NaCl mass fraction (bulk) [kg/kg] |
| TC_max | Maximum temperature to be calculated [K] |

### Value

a list object including all the phase relation information

## driesner07_H2O_NaCl_get_properties_TpX

*Get H2O-NaCl fluid properties at the given temperature, pressure, and NaCl mass fraction*

### Description

Get H2O-NaCl fluid properties at the given temperature, pressure, and NaCl mass fraction

### Usage

```
driesner07_H2O_NaCl_get_properties_TpX(TK, p, X, print = FALSE)
```

### Arguments

| | |
|---|---|
| TK | Temeprature [K] |
| p | Pressure [Pa] |
| X | Bulk NaCl mass fraction [kg/kg] |
| print | TRUE for printing the calculated properties |

### Value

a nested list object including the fluid properties

## driesner07_H2O_NaCl_get_Tp_curve_on_F_VL_boundary

*get an array of T and p values along a phase boundary between F and VL regions*

### Description

get an array of T and p values along a phase boundary between F and VL regions

### Usage

```
driesner07_H2O_NaCl_get_Tp_curve_on_F_VL_boundary(massfrac_NaCl, TCmax)
```

### Arguments

| | |
|---|---|
| massfrac_NaCl | NaCl mass fraction (bulk) [kg/kg] |
| TCmax | Maximum temperature to be calculated [K] |

### Value

dataframe object including calculated TK and p values

## driesner07_H2O_NaCl_get_Tp_curve_on_VL_VH_boundary

*get an array of T and p values along a phase boundary between VL and VH regions*

### Description

get an array of T and p values along a phase boundary between VL and VH regions

### Usage

```
driesner07_H2O_NaCl_get_Tp_curve_on_VL_VH_boundary(TCmax, n = 50)
```

### Arguments

| | |
|---|---|
| TCmax | Maximum temperature to be calculated [K] |
| n | the number of sampling temperatures |

### Value

dataframe object including calculated TK and p values

## driesner07_H2O_NaCl_LH_xl_Tp

*Saturated liquid composition at L+H coexisting, Function of Temperature and Pressure*

### Description

The function returns the saturated liquid composition at L+Halite coexisting surface for given temperature and pressure.

### Usage

```
driesner07_H2O_NaCl_LH_xl_Tp(TK, p)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |
| p | Pressure [Pa] |

### Value

Mole fraction [-]

## driesner07_H2O_NaCl_pc_T

*Critical pressuer of H2O-NaCl fluid as a function of temperature*

### Description

Returns critical pressure of H2O-NaCl fluid at the given temperature

### Usage

```
driesner07_H2O_NaCl_pc_T(TK)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |

### Value

Critical pressure [Pa]

## driesner07_H2O_NaCl_pc_T2

*Critical pressuer of H2O-NaCl fluid as a function of temperature using saturation pressure of water below critical temperature*

### Description

Returns critical pressure of H2O-NaCl fluid at the given temperature

### Usage

```
driesner07_H2O_NaCl_pc_T2(TK)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |

### Value

Critical pressure [Pa]

## driesner07_H2O_NaCl_phase_Tpx

*Phase id of H2O-NaCl fluid as a function of temperature, pressure, and NaCl composition*

### Description

Returns phase id of H2O-NaCl fluid at the given temperature, pressure, and bulk salinity

### Usage

```
driesner07_H2O_NaCl_phase_Tpx(TK, p, x)
```

### Arguments

| | |
|---|---|
| TK | Temeprature [K] |
| p | Pressure [Pa] |
| x | Bulk composition (mole fraction) of NaCl [mol/mol] |

### Value

phase id

## driesner07_H2O_NaCl_plot_phase_relation_on_Tp_space

*plot H2O-NaCl phase diagram on T-p space*

### Description

plot H2O-NaCl phase diagram on T-p space

### Usage

```
driesner07_H2O_NaCl_plot_phase_relation_on_Tp_space(dat, TC_range_max = 800)
```

### Arguments

| | |
|---|---|
| dat | H2O-NaCl phase relation information |
| TC_range_max | Maximum temperature to be plotted [K] |

---

`driesner07_H2O_NaCl_rho_pTx`

*Salinewater density, Function of Temperature, Pressure, and composition*

---

## Description

The function returns the saline water density for given temperature, pressure, and composition.

## Usage

```
driesner07_H2O_NaCl_rho_pTx(p, TK, x)
```

## Arguments

| | |
|---|---|
| `p` | Pressure [Pa] |
| `TK` | Temperature [K] |
| `x` | Mole fraction [-] |

## Value

Density [kg/m3]

---

`driesner07_H2O_NaCl_rho_singlephase_pTx`

*Salinewater density, Function of Temperature, Pressure, and composition*

---

## Description

The function returns the saline water density for given temperature, pressure, and composition.

## Usage

```
driesner07_H2O_NaCl_rho_singlephase_pTx(p, TK, x)
```

## Arguments

| | |
|---|---|
| `p` | Pressure [Pa] |
| `TK` | Temperature [K] |
| `x` | Mole fraction [-] |

## Value

Density [kg/m3]

## driesner07_H2O_NaCl_singlephase_h_Tpx

*Salinewater Specific Enthalphy, Function of Temperature, Pressure, and composition*

### Description

The function returns the saline water specific enthalpy for given temperature, pressure, and composition.

### Usage

```
driesner07_H2O_NaCl_singlephase_h_Tpx(TK, p, x)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |
| p | Pressure [Pa] |
| x | Mole fraction [-] |

### Value

Specific Enthalpy [J/kg]

## driesner07_H2O_NaCl_singlephase_p_rhoTx

*calculate pressure from salinewater density and salinity*

### Description

calculate pressure from salinewater density and salinity

### Usage

```
driesner07_H2O_NaCl_singlephase_p_rhoTx(rho, TK, x, pVL, pmax = 5e+08)
```

### Arguments

| | |
|---|---|
| rho | Density [kg/m^3] |
| TK | Temperature [K] |
| x | Mole fraction [-] |
| pVL | V-L pressure used as lower bound [Pa] |
| pmax | upper bound of pressure [Pa] |

### Value

pressure [Pa]

---

`driesner07_H2O_NaCl_Tc_x`

*Critical temperature of H2O-NaCl fluid as a function of NaCl composition*

---

## Description

Returns critical temperature of H2O-NaCl fluid at the given composition

## Usage

```
driesner07_H2O_NaCl_Tc_x(x)
```

## Arguments

| | |
|---|---|
| `x` | Composition (mole fraction) of NaCl [mol/mol] |

## Value

Temperature [K]

---

`driesner07_H2O_NaCl_VH_vol_frac_h`

*Halite volume fraction in V+H phase*

---

## Description

The function returns the solid volume fraction in V+H phase for given temperature, pressure, and composition.

## Usage

```
driesner07_H2O_NaCl_VH_vol_frac_h(TK, p, x)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |
| `p` | Pressure [Pa] |
| `x` | NaCl composition [mol/mol] |

## Value

Volume fraction [m3/m3]

---

`driesner07_H2O_NaCl_VH_xv_Tp`

*Saturated vapor composition at V+H coexisting, Function of Temperature and Pressure*

---

## Description

The function returns the saturated vapor composition at V+Halite coexisting surface for given temperature and pressure.

## Usage

```
driesner07_H2O_NaCl_VH_xv_Tp(TK, p)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |
| `p` | Pressure [Pa] |

## Value

Mole fraction [-]

---

`driesner07_H2O_NaCl_VLH_p_T`

*Saturation pressure at V+L+H surface, Function of Temperature*

---

## Description

The function returns the saturation pressure at V+L+Halite coexisting surface for given temperature.

## Usage

```
driesner07_H2O_NaCl_VLH_p_T(TK)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |

## Value

Pressure [Pa]

## driesner07_H2O_NaCl_VLH_T_xv

*get temperature of VLH curve at the given vapor x*

### Description

get temperature of VLH curve at the given vapor x

### Usage

```
driesner07_H2O_NaCl_VLH_T_xv(xv)
```

### Arguments

| | |
|---|---|
| xv | NaCl composition (mole fraction) of vapor [mol/mol] |

### Value

Temperature [K]

## driesner07_H2O_NaCl_VLH_xl_T

*Saturated liquid composition at V+L+H surface, Function of Temperature*

### Description

The function returns the saturated liquid composition at V+L+Halite coexisting surface for given temperature.

### Usage

```
driesner07_H2O_NaCl_VLH_xl_T(TK)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |

### Value

Mole fraction [-]

## driesner07_H2O_NaCl_VLH_xv_T

*Saturated vapor composition at V+L+H surface, Function of Temperature*

### Description

The function returns the saturated vapor composition at V+L+Halite coexisting surface for given temperature.

### Usage

```
driesner07_H2O_NaCl_VLH_xv_T(TK)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |

### Value

Mole fraction [-]

## driesner07_H2O_NaCl_VL_mass_frac_l

*Liquid mass fraction in V+L phase*

### Description

The function returns the liquid mass fraction in V+L phase for given temperature, pressure, and composition.

### Usage

```
driesner07_H2O_NaCl_VL_mass_frac_l(TK, p, x)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |
| p | Pressure [Pa] |
| x | NaCl composition [mol/mol] |

### Value

Mass fraction [kg/kg]

---

`driesner07_H2O_NaCl_VL_mass_frac_v`
*Vapor mass fraction in V+L phase*

---

## Description

The function returns the vapor mass fraction in V+L phase for given temperature, pressure, and composition.

## Usage

```
driesner07_H2O_NaCl_VL_mass_frac_v(TK, p, x)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |
| `p` | Pressure [Pa] |
| `x` | NaCl composition [mol/mol] |

## Value

Mass fraction [kg/kg]

---

`driesner07_H2O_NaCl_VL_pl_Tx`
*get liquid phase pressure in V+L region at the given T and x*

---

## Description

get liquid phase pressure in V+L region at the given T and x

## Usage

```
driesner07_H2O_NaCl_VL_pl_Tx(TK, x)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |
| `x` | Bulk composition (mole fraction) of NaCl [mol/mol] |

## Value

a list of liquid pressures [Pa]

## driesner07_H2O_NaCl_VL_pv_Tx

*get vapor phase pressure(s) in V+L region at the given T and x*

### Description

get vapor phase pressure(s) in V+L region at the given T and x

### Usage

```
driesner07_H2O_NaCl_VL_pv_Tx(TK, x)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |
| x | Bulk composition (mole fraction) of NaCl [mol/mol] |

### Value

a list of vapor pressures [Pa]

## driesner07_H2O_NaCl_VL_rhol_Tp

*Saturated liquid density at V+L surface, Function of Temperature and Pressure*

### Description

The function returns the saturated liquid density at V+L surface for given temperature and pressure.

### Usage

```
driesner07_H2O_NaCl_VL_rhol_Tp(TK, p)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |
| p | Pressure [Pa] |

### Value

Density [kg/m3]

---

`driesner07_H2O_NaCl_VL_rhov_Tp`

*Saturated vapor density at V+L surface, Function of Temperature and Pressure*

---

## Description

The function returns the saturated vapor density at V+L surface for given temperature and pressure.

## Usage

```
driesner07_H2O_NaCl_VL_rhov_Tp(TK, p)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |
| `p` | Pressure [Pa] |

## Value

Density [kg/m3]

---

`driesner07_H2O_NaCl_VL_vol_frac_l`

*Liquid volume fraction in V+L phase*

---

## Description

The function returns the liquid volume fraction in V+L phase for given temperature, pressure, and composition.

## Usage

```
driesner07_H2O_NaCl_VL_vol_frac_l(TK, p, x)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |
| `p` | Pressure [Pa] |
| `x` | NaCl composition [mol/mol] |

## Value

Volume fraction [m3/m3]

## driesner07_H2O_NaCl_VL_vol_frac_v

*Vapor volume fraction in V+L phase*

### Description

The function returns the vapor volume fraction in V+L phase for given temperature, pressure, and composition.

### Usage

```
driesner07_H2O_NaCl_VL_vol_frac_v(TK, p, x)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |
| p | Pressure [Pa] |
| x | NaCl composition [mol/mol] |

### Value

Volume fraction [m3/m3]

## driesner07_H2O_NaCl_VL_xl_Tp

*Saturated liquid composition at V+L surface, Function of Temperature and Pressure*

### Description

The function returns the saturated liquid composition at V+L surface for given temperature and pressure.

### Usage

```
driesner07_H2O_NaCl_VL_xl_Tp(TK, p)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |
| p | Pressure [Pa] |

### Value

Mole fraction [-]

---

`driesner07_H2O_NaCl_VL_xv_Tp`
*Saturated vapor composition at V+L surface, Function of Temperature and Pressure*

---

## Description

The function returns the saturated vapor composition at V+L surface for given temperature and pressure.

## Usage

```
driesner07_H2O_NaCl_VL_xv_Tp(TK, p)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |
| `p` | Pressure [Pa] |

## Value

Mole fraction [-]

---

`driesner07_H2O_NaCl_write_phase_relation_on_Tp_space`
*save H2O-NaCl phase relations on T-p space to a text file*

---

## Description

save H2O-NaCl phase relations on T-p space to a text file

## Usage

```
driesner07_H2O_NaCl_write_phase_relation_on_Tp_space(dat, filename)
```

## Arguments

| | |
|---|---|
| `dat` | H2O-NaCl phase relation information |
| `filename` | Output file name |

## driesner07_H2O_NaCl_xc_T

*Critical NaCl composition of H2O-NaCl fluid as a function of temperature*

### Description

Returns critical composition of H2O-NaCl fluid at the given temperature

### Usage

```
driesner07_H2O_NaCl_xc_T(TK)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |

### Value

Critical composition (mole fraction) of NaCl [mol/mol]

## geofluidprop *geofluidprop*

### Description

A library for computing physical properties of geological fluids

## granite_ec_Olhoeft1981_T

*Electrical conductivity model for dry granite based on Olhoeft (1981, JGR) figure*

### Description

Electrical conductivity model for dry granite based on Olhoeft (1981, JGR) figure

### Usage

```
granite_ec_Olhoeft1981_T(TK)
```

### Arguments

| | |
|---|---|
| TK | Temperature [K] |

### Value

electrical conductivity of dry granite [S/m]

---

`H2ONaCl_b_to_M` *Convert H2O-NaCl concentration unit from molality to mole fraction*

---

### Description

Convert concentration unit of saline water

### Usage

```
H2ONaCl_b_to_M(m, rho = 998.2)
```

### Arguments

| | |
|---|---|
| `m` | molality [mol/kg-H2O] |
| `rho` | density [kg/m3] |

### Value

Molar concentration [mol/L]

---

`H2ONaCl_b_to_massfrac` *Convert H2O-NaCl concentration unit from molality to mass fraction*

---

### Description

Convert H2O-NaCl concentration unit from molality to mass fraction

### Usage

```
H2ONaCl_b_to_massfrac(b)
```

### Arguments

| | |
|---|---|
| `b` | molality [mol/kg-H2O] |

### Value

mass fraction of NaCl [kg/kg]

## H2ONaCl_b_to_x *Convert H2O-NaCl concentration unit from molality to mole fraction*

### Description

Convert concentration unit of saline water

### Usage

```
H2ONaCl_b_to_x(molality)
```

### Arguments

| | |
|---|---|
| molality | molality [mol/kg-H2O] |

### Value

Mole fraction [-]

## H2ONaCl_ec_SakumaIchiki2016_highP *H2O-NaCl fluid electrical conductivity model in Sakuma and Ichiki (2016) for high pressures*

### Description

The model is valid for 0.2-2 GPa, 673-2000K, 0.6-9.6wt%.

### Usage

```
H2ONaCl_ec_SakumaIchiki2016_highP(p, T, c)
```

### Arguments

| | |
|---|---|
| p | Pressure [MPa] |
| T | Temperature [K] |
| c | Salinity [wt%] |

### Value

Electrical conductivity [ohm^-1 m^-1]

### References

Sakuma, H., Ichiki, M. (2016) Electrical conductivity of NaCl-H2O fluid in the crust. JGR Solid Earth.

`H2ONaCl_ec_SakumaIchiki2016_lowP`

*H2O-NaCl fluid electrical conductivity model in Sakuma and Ichiki (2016) for low pressures*

## Description

The model is valid for <0.2 GPa, <600K, 0.6-9.6wt% NaCl

## Usage

```
H2ONaCl_ec_SakumaIchiki2016_lowP(p, TK, c)
```

## Arguments

| | |
|---|---|
| `p` | Pressure [MPa] |
| `TK` | Temperature [K] |
| `c` | Salinity [wt%] |

## Value

Electrical conductivity [ohm^-1 m^-1]

## References

Sakuma, H., Ichiki, M. (2016) Electrical conductivity of NaCl-H2O fluid in the crust. JGR Solid Earth.

`H2ONaCl_ec_SenGoode1992`

*H2O-NaCl fluid electrical conductivity model by Sen & Goode (1992)*

## Description

The model is valid for 20-200 C.

## Usage

```
H2ONaCl_ec_SenGoode1992(m, TC)
```

## Arguments

| | |
|---|---|
| `m` | NaCl molality [mol/kg] |
| `TC` | Temperature [deg C] |

## Value

Electrical conductivity [S/m]

## References

Sen, P.N., Goode, P.A. (1992) Influence of temperature on electrical conductivity of shaly sands, Geophysics 57 (1), 89–96.

Sen, P.N., Goode, P.A. (1992) Errata, to "influence of temperature on electrical conduc- tivity of shaly sands", Geophysics 57 (12), 1658.

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`H2ONaCl_ec_SinmyoKeppler2017`

*H2O-NaCl fluid electrical conductivity model by Sinmyo and Keppler (2017)*

---

## Description

H2O-NaCl fluid electrical conductivity model by Sinmyo and Keppler (2017)

## Usage

```
H2ONaCl_ec_SinmyoKeppler2017(pMPa, TK, c_wtp)
```

## Arguments

| | |
|---|---|
| `pMPa` | Pressure [MPa] |
| `TK` | Temperature [K] |
| `c_wtp` | Salinity [wt%] |

## Value

Electrical conductivity [ohm^-1 m^-1]

## References

Sinmyo, R., Keppler, H. (2017) Electrical conductivity of NaCl-bearing aqueous fluids to 600C and 1GPa. Contrib Mineral Petrol 172:4

---

`H2ONaCl_ec_WatanabeEtAl2021_Tpm`

*H2O-NaCl fluid electrical conductivity model in Watanabe et al (2021, FPE)*

---

## Description

H2O-NaCl fluid electrical conductivity model in Watanabe et al (2021, FPE)

## Usage

```
H2ONaCl_ec_WatanabeEtAl2021_Tpm(TK, pMPa, m)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |
| `pMPa` | Pressure [MPa] |
| `m` | NaCl molality [mol/kg-H2O] |

## Value

Electrical conductivity [S/m]

---

`H2ONaCl_ec_WatanabeEtAl2022_density_model_Tpm`

*H2O-NaCl fluid electrical conductivity model for low density conditions in Watanabe et al (2022, Geothermics)*

---

## Description

H2O-NaCl fluid electrical conductivity model for low density conditions in Watanabe et al (2022, Geothermics)

## Usage

```
H2ONaCl_ec_WatanabeEtAl2022_density_model_Tpm(TK, pMPa, m)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |
| `pMPa` | Pressure [MPa] |
| `m` | NaCl molality [mol/kg-H2O] |

## Value

Electrical conductivity [S/m]

## H2ONaCl_massfrac_to_b *Convert H2O-NaCl concentration unit from mass fraction to molality*

### Description

Convert H2O-NaCl concentration unit from mass fraction to molality

### Usage

```
H2ONaCl_massfrac_to_b(X)
```

### Arguments

| | |
|---|---|
| X | Mass fraction [kg/kg] |

### Value

molality [mol/kg-H2O]

## H2ONaCl_massfrac_to_M *Convert H2O-NaCl concentration unit from mass fraction to molar concentration*

### Description

Convert H2O-NaCl concentration unit from mass fraction to molar concentration

### Usage

```
H2ONaCl_massfrac_to_M(X, rho = 998.2)
```

### Arguments

| | |
|---|---|
| X | Mass fraction [kg/kg] |
| rho | Solution density [kg/m3] |

### Value

Molar concentraion [mol/L]

## H2ONaCl_massfrac_to_x *Convert H2O-NaCl concentration unit from mass fraction to mole fraction*

### Description

Convert concentration unit of saline water

### Usage

```
H2ONaCl_massfrac_to_x(mass_frac)
```

### Arguments

| | |
|---|---|
| mass_frac | Mass fraction [-] |

### Value

Mole fraction [-]

## H2ONaCl_molar_ec_WatanabeEtAl2021_vism *Molar electrical conductivity model of H2O-NaCl fluids in Watanabe et al (2021, FPE)*

### Description

Molar electrical conductivity model of H2O-NaCl fluids in Watanabe et al (2021, FPE)

### Usage

```
H2ONaCl_molar_ec_WatanabeEtAl2021_vism(vis, m)
```

### Arguments

| | |
|---|---|
| vis | viscosity [Pa s] |
| m | NaCl molality [mol/kg-H2O] |

### Value

Molar conductivity [Sm^2/mol]

## H2ONaCl_M_to_b *Convert H2O-NaCl concentration unit from molar concentration to mass fraction*

### Description

Convert concentration unit of saline water from molar concentration to mass fraction

### Usage

```
H2ONaCl_M_to_b(M, rho = 998.2)
```

### Arguments

| | |
|---|---|
| M | Molar concentraion [mol/L] = [M] |
| rho | Solution density [kg/m3] |

### Value

molality [mol/kg-H2O]

## H2ONaCl_M_to_massfrac *Convert H2O-NaCl concentration unit from molar concentration to mass fraction*

### Description

Convert concentration unit of saline water from molar concentration to mass fraction

### Usage

```
H2ONaCl_M_to_massfrac(M, rho = 998.2)
```

### Arguments

| | |
|---|---|
| M | Molar concentraion [mol/L] = [M] |
| rho | Solution density [kg/m3] |

### Value

Mass fraction [kg/kg]

## H2ONaCl_M_to_x *Convert H2O-NaCl concentration unit from molar concentration to molar fraction*

### Description

Convert H2O-NaCl concentration unit from molar concentration to molar fraction

### Usage

```
H2ONaCl_M_to_x(M, rho = 998.2)
```

### Arguments

| | |
|---|---|
| M | Molarity [mol/L] |
| rho | Solution density [kg/m3] |

### Value

Mole fraction of NaCl [mol/mol]

## H2ONaCl_x_to_massfrac *Convert H2O-NaCl concentration unit from mole fraction to mass fraction*

### Description

Convert concentration unit of saline water

### Usage

```
H2ONaCl_x_to_massfrac(mole_frac)
```

### Arguments

| | |
|---|---|
| mole_frac | Mole fraction [-] |

### Value

Mass fraction [-]

## iapws95_rho_pT *Water density using IAPWS-95*

### Description

Water density using IAPWS-95

### Usage

```
iapws95_rho_pT(pPa, TK)
```

### Arguments

| | |
|---|---|
| pPa | pressure [Pa] |
| TK | Temperature [K] |

### Value

water density [kg/m^3]

## klyukinetal2017_H2O_NaCl_viscosity_rhoTx *Dynamic Viscosity of Salinewater, Function of Density, Temperature, and Salinity*

### Description

Dynamic Viscosity of Salinewater, Function of Density, Temperature, and Salinity

### Usage

```
klyukinetal2017_H2O_NaCl_viscosity_rhoTx(rho, TK, x)
```

### Arguments

| | |
|---|---|
| rho | Fluid density [kg/m3] |
| TK | Temperature [K] |
| x | Salinity in mole fraction [mol/mol] |

### Value

Dynamic viscosity [Pa s]

## References

Klyukin, Y.I., Lowell R.P., Bodnar, R.J. (2017) A revised empirical model to calculate the dynamic viscosity of H2O-NaCl fluids at elevated temperatures and pressures (<=1000 C, <=500 MPa, 0-100 wt Equilibria 433, 193-205.

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`melt_ec_rhyolite_Gaillard2004_Tpw`

*Electrical conductivity model for hydrous rhyolitic–granitic melts in Gaillard (2004, EPSL)*

---

## Description

Electrical conductivity model for hydrous rhyolitic–granitic melts in Gaillard (2004, EPSL)

## Usage

```
melt_ec_rhyolite_Gaillard2004_Tpw(TK, pMPa, wtp_H2O)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |
| `pMPa` | Pressure [MPa] |
| `wtp_H2O` | Weight percent of H2O [%] |

## Value

electrical conductivity [S/m]

---

`melt_ec_rhyolite_GuoEtAl2016_Tpw`

*Electrical conductivity model for rhyolitic melt in Guo et al (2016, EPSL)*

---

## Description

Electrical conductivity model for rhyolitic melt in Guo et al (2016, EPSL)

## Usage

```
melt_ec_rhyolite_GuoEtAl2016_Tpw(TK, pGPa, wtp_H2O)
```

## Arguments

| | |
|---|---|
| `TK` | Temperature [K] |
| `pGPa` | Pressure [GPa] |
| `wtp_H2O` | Weight percent of H2O [%] |

### Value

electrical conductivity [S/m]

---

`phi_Archie_ec` *Calculate porosity from bulk electrical conductivity using Archie's law*

---

### Description

Calculate porosity from bulk electrical conductivity using Archie's law

### Usage

```
phi_Archie_ec(sigma_bulk, sigma_f, m)
```

### Arguments

| | |
|---|---|
| `sigma_bulk` | bulk electrical conductivity [S/m] |
| `sigma_f` | fluid electrical conductivity [S/m] |
| `m` | cementation exponent [-] |

### Value

porosity [-]

---

`phi_HSupper_ec` *Calculate porosity from bulk electrical conductivity using Hashin-Shtrikman upper bound*

---

### Description

Calculate porosity from bulk electrical conductivity using Hashin-Shtrikman upper bound

### Usage

```
phi_HSupper_ec(sb, sf, ss)
```

### Arguments

| | |
|---|---|
| `sb` | bulk electrical conductivity [S/m] |
| `sf` | fluid electrical conductivity [S/m] |
| `ss` | Solid electrical conductivity [S/m] |

### Value

porosity [-]

## printf *C-like printf*

### Description

C-like printf

### Usage

```
printf(...)
```

### Arguments

| | |
|---|---|
| ... | arguments |

## toC *convert temperature in Kelvin to degree C*

### Description

convert temperature in Kelvin to degree C

### Usage

```
toC(TK)
```

### Arguments

| | |
|---|---|
| TK | temperature in K |

### Value

temperature in deg C

toK *convert temperature in degree C to Kelvin*

## Description

convert temperature in degree C to Kelvin

## Usage

```
toK(TC)
```

## Arguments

| | |
|---|---|
| TC | temperature in deg C |

## Value

temperature in K

# Index