

Enter materials in Simu-Therm

Hilger & Daniel Software GmbH
www.simu-therm.de

Contents

1 Enter materials in Simu-Therm

- Introduction to Simu-Therm's material management
- Create your own material data files
- Select database to store
- Store a material
- Chemical analysis
- Usage of material groups
- Colour and price
- Usage of remark texts

Introduction to Simu-Therm's material management

Simu-Therm stores material data in text files with UNICODE (UTF16) character type. Up to **10 material data files** can be accessed simultaneously. The 10 material files can be stored anywhere on the computer or server. Their locations are listed initially in the file **STMLOC_HDS_material_files.txt**

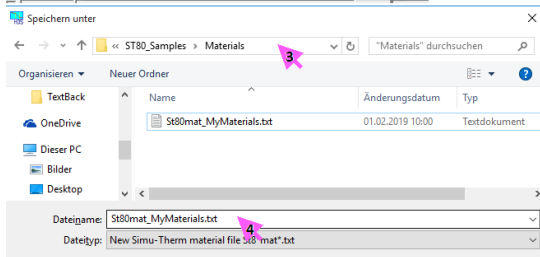
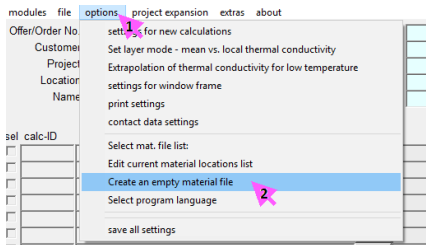
Every user can create one or more own lists of preferred material sources. This is useful e.g. to switch among working online or offline.

In the tutorial **Excel Material Import.pdf** you can find how to create a Simu-Therm material file from a MS Excel data base table.

In **Dataformat_Simu-Therm8_2020.pdf** there is also a description of the Simu Therm material data format which enables you to built up S-T material files by programming.

Create a new material data file

1. use dropdown menu *options*
2. select *create an empty material file*
3. determine a path where to store the new file
4. enter a file name, e.g. *ST80mat_MyMaterials.txt*



Add file to the material files list

In order to get access to the new material file, it has to be added to the current access list.

1. use dropdown menu *options*
2. select *Edit current material locations list*
3. enter a name to be shown in the material selection dialog
4. click on button *Select file*
5. select the new file created in the previous step

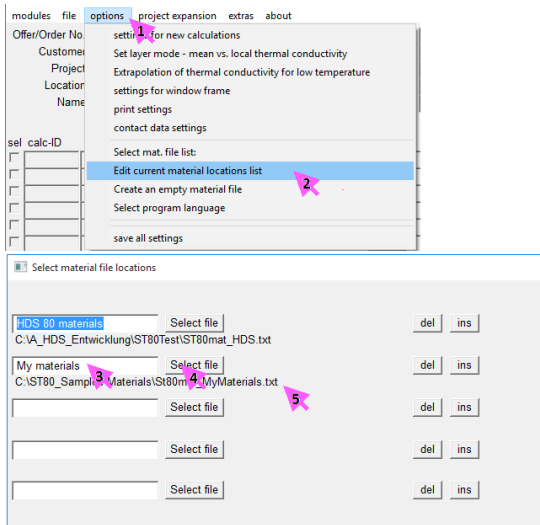
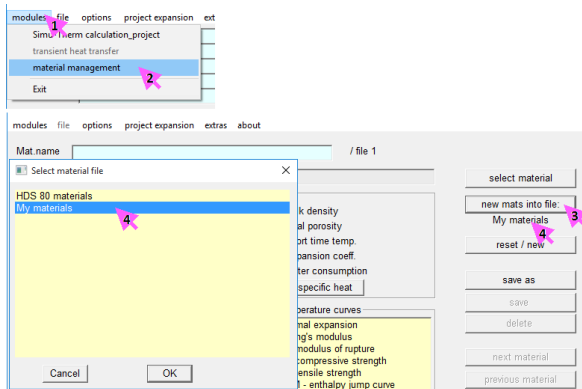


Figure: select layer properties dialog

Select database to store the material

1. use dropdown menu *modules*
2. select *material management*
3. click on button *new mats into file*
4. select the new material database *My materials*



Enter and store mandatory data

1. enter material name: *Castable 2500*
2. select material type: *castable* - controls basic properties of the material
3. enter density: $2500 \frac{\text{kg}}{\text{m}^3}$ - needed to calculate the weight and heat storage of a layer
4. enter open porosity: *28%* - needed to calculate the impact of hydrogen
5. to save the material, click on button **save as** and enter a unique material key, e.g. *CAST25*

modules file options project expansion extras about

Mat.name CAST25 / file 1

analysis

Calculation relevant figures

Mat.type	castable	2500 kg/m³	bulk density
28 %	porosity	0 %	total porosity
0 °C	service temperature	0 °C	short time temp.
0 MPa	Young's modulus	0 10⁻⁶/K	expansion coeff.
0 kg/m³	water consumption	0 %	water consumption
0 MPa	cold compressive		specific heat

new material number, at least three characters:

Esc OK

temperature curves
thermal expansion
Young's modulus
modulus of rupture
compressive strength
tensile strength
enthalpy jump curve
linear change

Enter recommended data

1. enter maximum service temperature: 1550°C - used for warnings in case of exceeding
2. enter expansion coefficient: $8.3 \frac{10^{-6}}{\text{K}}$ - needed for thermal expansion - 8.3 means: expansion 0.83 % between 0°C and 1000°C
3. enter water consumption in percent of dry matter and in $\frac{\text{kg}}{\text{m}^3}$
4. cold compressive strength: 28 MPa - for information only
5. click on button **more** to enter a curve of thermal conductivity - needed for any heat loss calculation

modules file options project expansion extras about

Mat. name: Castable 2500 CAST25 / file 1

analysis

Calculation relevant figures

Mat. type	castable	2500 kg/m³	bulk density
28 %	porosity	32 %	total porosity
1550 °C	service temperature	0 °C	short time temp.
0 MPa	Young's modulus	$8.3 \cdot 10^{-6}/\text{K}$	expansion coeff.
175 kg/m³	water consumption	7 %	water consumption
25 MPa	cold compressive		specific heat

thermal conductivity

°C W/mK

400	1.5	more
700	1.4	
1000	1.5	
1200	1.7	graphic

>> manufact. > 20190205 mat. sheet date

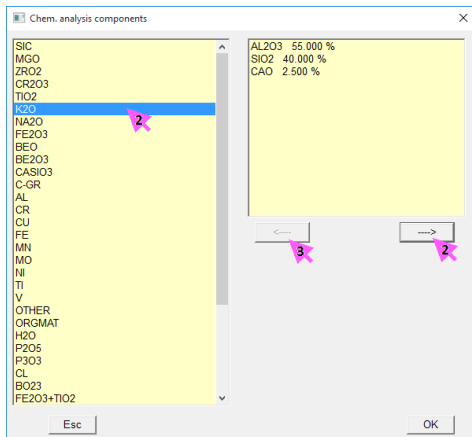
>> material data > alias > price >

Enter chemical analysis

The chemical composition is used to calculate the specific heat capacity, if at least 90% of the weight is determined. Up to 10 components can be entered.

1. click on button **analysis** to open the dialog for chemical analysis
2. to enter a chemical component: mark the component in the left column and click on the right arrow to add it (right column)
3. reverse: remove a component from the analysis with the left arrow
4. the **list of components** can be altered in the file

MATERIAL_ATTRIBUTES.TXT



Usage of material groups

The material group should be a rough characterization of a material. It is used to preselect materials and to hide the material name in printouts.

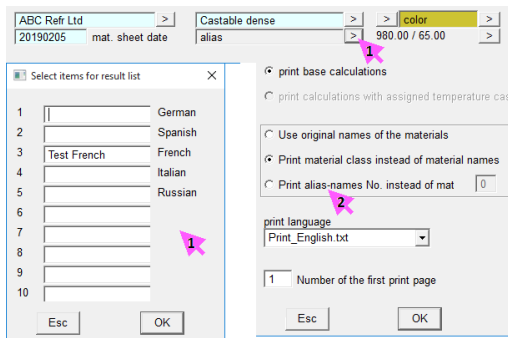
1. enter a material group or use the small arrow to select one from a list
2. in the print dialog you can select (2) to use material group in place in order to hide the material name

The screenshot displays the Simu-Therm software interface. At the top, there are input fields for material identification: 'ABC Refr Ltd' and '20190205' (mat. sheet date). To the right, a dropdown menu is set to 'Castable dense', and further right, a 'color' field is highlighted in yellow. Below these fields, a 'Select material class' dialog box is open, showing a list of material classes. The list includes 'all (reset class selection)', 'Metal', 'Non-refractory', 'Refractory insulation', 'Fireclay insulating', 'Fireclay', 'Refractory fiber material', 'Silicon carbide', 'Refractory carbon', 'Castable light weight', 'Castable dense' (which is highlighted in blue), and 'Constant ref'. At the bottom of this dialog are 'Cancel' and 'OK' buttons. To the right of the dialog, the 'print' options are visible. The 'print base calculations' radio button is selected. Other options include 'print calculations with assigned temperature cases', 'Use original names of the materials', 'Print material class instead of material names' (which is selected), and 'Print alias-names No. instead of mat' with a value of '0'. Below these, the 'print language' is set to 'Print_English.txt' and the 'Number of the first print page' is set to '1'. At the bottom right of the print section are 'Esc' and 'OK' buttons.

Alias names

Like the material group, alias names are used to hide the material name in printouts in different ways. E.g. it could be translations of the material group to several languages.

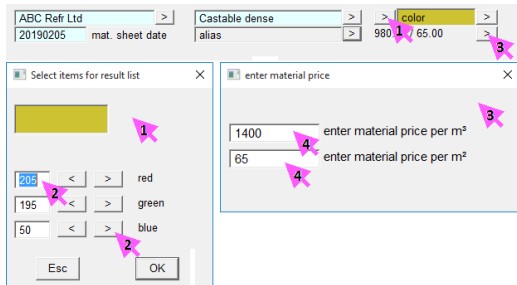
1. click on the small arrow to open the dialog for alias names
 2. in the print dialog you can select (2) to use an alias name in order to hide the material name
- Again, the **list of alias names** can be altered in the file **MATERIAL_ATTRIBUTES.TXT**



Enter colour and price

A colour for printout can be assigned to the material. If not, S-T's default colour is used, depending of the max. service temperature. The price is used to compute e.g. the cost of 1 m (1 ft) of tube.

1. click on the small left arrow to open the colour dialog.
2. enter values (0 to 255) of the colour components red, green blue or select with the arrow buttons.
3. click on the right arrow to open the price dialog.
4. enter a price per volume and/or a price per area.



Usage of remark texts

Remarks are unformatted additional texts. To simplify typing, S-T offers to use predefined remarks.

1. click on the small arrow right of a remark line to open the remark dialog. Enter a free text or

2. click on the button *predefined remarks* to select a text from a list.

Again, the **list of remarks** can be altered in the file

MATERIAL_ATTRIBUTES.TXT

