

90. Material Database

Material Database is a new HSC module that can be used to save information on different materials into the same database, such as concentrates, fuels, sludges, steels, plastics, etc. which may be used as raw materials for HSC Sim process models. Material properties contain fields for composition, physical properties, analyses, etc. It is also possible to create user-defined properties.

90.1. Materials

Materials are mixtures of species and other materials. The composition of a material can always be broken down to species and elements, which are shown on the right side of the composition (Fig 1). Materials within the composition are indicated with the Material name written with square brackets (e.g. [Steel]). The composition of a material should always add up to 100%.

Composition		Analyses					
Material: Feed Material							
A7							
1	Composition	wt-%	Species	wt-%	Elements	wt-%	Reference
2	Total	100.000		100.000		100.000	
3	[Concentrate]	75.000	CuFeS2	16.838	Cu	13.335	
4	[Silica Flux]	20.000	Cu5FeS4	1.316	Fe	23.795	
5	C	3.000	Cu2S	8.355	S	26.038	
6	H2O	2.000	FeS	9.428	Zn	0.881	
7			FeS2	26.250	Ni	0.426	
8			ZnS	1.313	Si	11.127	
9			NiS	0.659	O	17.188	
10			SiO2	23.805	Mg	2.429	
11			MgO	4.029	Al	0.770	
12			Al2O3	1.455	Ca	0.786	
13			Fe2O3	0.454	C	3.000	
14			CaO	1.100	H	0.224	
15			C	3.000			
16			H2O	2.000			
17							
18							

Fig 1. Composition of a material.

In addition to the composition, materials also have physical properties, which are listed on the editor's right-hand side spreadsheet (Fig 2). Many of the properties have blank initial value and it is up to the user to update them. Some of the properties can be estimated using the "Auto Calculate" option, which uses the composition to calculate the weighted average of the property.

Common		Cp Data	Cp Chart		
C2					
A	B	C	D	E	F
1	Heat & State	Value	Unit	Reference	Auto Calculate
2	State at 25 °C		Text		
3	Average molar weight	111.931	g/mol		TRUE
4	Density	4.062	kg/l		TRUE
5	Melting Point		K		
6	Boiling Point		K		
7	Heat Capacity		J/(kg*K)		
8	Enthalpy at 25 °C	-5661.374	kJ/kg		TRUE
9	Heat of Fusion		kJ/kg		
10	Heat of Vaporization		kJ/kg		
11	Electrical & Magnetic	Value	Unit	Reference	Auto Calculate
12	Electrical Conductivity		S/m		
13	Mass Susceptibility		m3/kg		
14	Magnetic permeability		H/m		
15	Mechanical	Value	Unit	Reference	Auto Calculate
16	Hardness (HV)		HV		
17	Hardness (Mohs)		Mohs		
18	Young's Modulus		MPa		

Fig 2. Material properties.

Heat capacity data is given the same way as in HSC Database using the polynomial function with coefficients and temperature ranges (Fig 3).

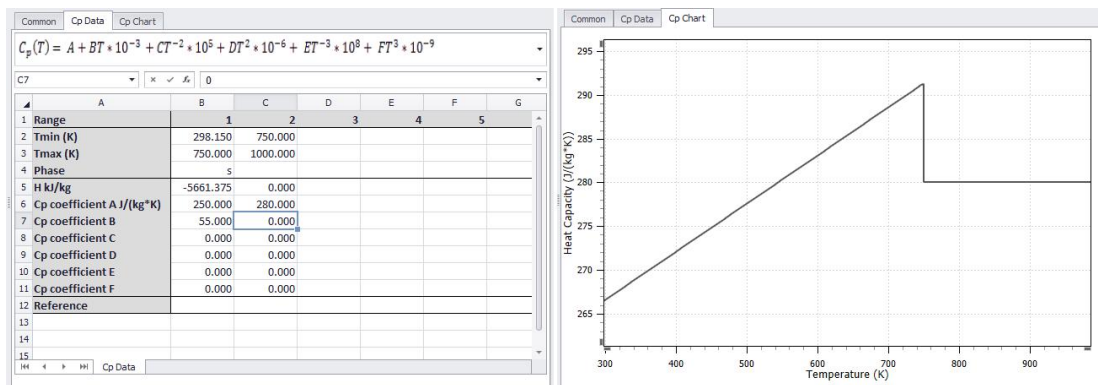


Fig 3. Cp Data