



Database name: TCS Solder Alloy Solutions Database
Database acronym: TCSLD1 **Database version:** 1.1
Database owner: Thermo-Calc Software AB
Database segment: Au-/Ag-/Cu-/Sn-based Solder Alloys

Brief Description

This solder alloy solution database was developed for thermodynamic calculations of Au-/Ag-/Cu-/Sn-based solder systems (Pb-containing/Pb-free), by Thermo-Calc Software (TCS). It can be used with the Thermo-Calc software (TCC and TCW), as well as with the DICTRA and TC-PRISMA software and with the TC-PI programming-interfaces.

It is desirable, where practicable, to remove some lead-containing components from commercial products for critical environmental considerations. One area where lead is extensively used is in lead-based solders. New lead-free solders must have the appropriate melting temperatures and freezing ranges, in order to be compatible with the existing equipment and components. Ultimately, all the toxic elements (Pb, Cd, As, Sb, ...) and environmentally problematic elements (Bi, ...) should be eliminated from commercial solders.

Applications

This solder alloy solution database can be used to predict various thermodynamic properties, and to show the effects of non-equilibrium solidification. The results from these predictions can be used to eliminate candidate solder alloys for which the calculations reveal unsuitable freezing temperature and range from further testing.

Included Elements (16)

Ag Al Au Bi Co Cu Ge In Ni Pb Pd Pt Sb Si Sn Zn

Included Phases

TCSLD1 (in the framework of aforementioned 16 elements) contains assessed data for more than 150 phases (most of them as multicomponent alloy solutions and/or intermediate compound solutions, and the rest as intermediate stoichiometric compounds).

Assessed Subsystems

Critically assessments and extrapolations have been conducted in the development of this TCSLD1 database.

Available binary subsystems are:

	Ag	Al	Au	Bi	Co	Cu	Ge	In	Ni	Pb	Pd	Pt	Sb	Si	Sn	Zn
Ag	-	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Al		-	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Au			-	x	x	x	x	x	x	x	x	x	x	x	x	x
Bi				-	x	x	x	x	x	x	x	x	x	x	x	x
Co					-	x	x	x	x	x	x	x	x	x	x	x
Cu						-	x	x	x	x	x	x	x	x	x	x
Ge							-	x	-	x	-	-	x	x	x	x
In								-	x	x	x	x	x	x	x	x
Ni									-	x	x	x	x	x	x	x
Pb										-	x	x	x	x	x	x
Pd											-	x	x	x	x	x
Pt												-	-	x	x	-
Sb													-	x	x	x
Si														-	x	x
Sn															-	x
Zn																-

Available ternary subsystems are:

Ag-Al-Bi Ag-Al-Cu Ag-Al-Si Ag-Au-Al Ag-Au-Bi Ag-Au-Cu Ag-Au-In Ag-Au-Ni Ag-Au-Pb Ag-Au-Sb
 Ag-Au-Zn Ag-Au-Sn Ag-Au-Si Ag-Bi-Cu Ag-Bi-In Ag-Bi-Pb Ag-Bi-Sn Ag-Bi-Sb Ag-Bi-Sn Ag-Co-Sn
 Ag-Cu-In Ag-Cu-Ni Ag-Cu-Pb Ag-Cu-Sn Ag-In-Sb Ag-In-Sn Ag-Ni-Sn Ag-Pb-Sb Ag-Pb-Sn Ag-Pb-Zn
 Ag-Ni-Sb Ag-Ni-Sn Ag-Sb-Sn Ag-Sb-Zn Ag-Sn-Zn Al-Au-Cu Al-Au-In Al-Au-Si Al-Au-Sn Al-Bi-Cu
 Al-Bi-Sb Al-Bi-Sn Al-Bi-Zn Al-Cu-Sb Al-In-Sb Al-In-Sn Al-Pb-Sn Al-In-Sn Al-Sb-Zn Au-Bi-Sb
 Au-Bi-Sn Au-Bi-Zn Au-Co-Sn Au-Cu-Zn Au-Cu-Pb Al-Cu-Zn Au-In-Pb Au-In-Sb Au-In-Sn Au-Ni-Sn
 Au-Pt-Sn Au-Sb-Si Au-Sb-Sn Au-Si-Sn Au-Sn-Zn Bi-Cu-Sn Bi-In-Pb Bi-In-Sn Bi-Pb-Sn Bi-Sb-Sn
 Bi-Sn-Ni Bi-Sn-Zn Cu-In-Sb Cu-In-Sn Cu-Ni-Pb Cu-Pb-Sn Cu-Si-Zn In-Ni-Sn In-Sb-Sn In-Sn-Zn

Extrapolations

For many other ternary, quaternary and higher-order subsystems, the analytical descriptions of critically-assessed lower-order constituent subsystems are combined, extrapolated and used to predict multicomponent systems, even for compositions and temperatures which have not been experimentally evaluated. Depending on the complexity of multicomponent solder systems, such an analytical prediction will be more or less accurate.