TCS Solder Alloy Solutions Mobility Database (MOBSLD2)

Technical Information

Available Starting with Thermo-Calc Version 2024b

Contents

MOBSLD2: TCS Solder Alloy Solutions Mobility Database

TCS Solder Alloy Solutions Mobility Database (MOBSLD) is a kinetic database containing mobility data for solder alloys. It is suitable for simulation of diffusion controlled phenomena using the add-on Diffusion Module (DICTRA) and/or Precipitation Module (TC-PRISMA). It can also be used together with all Thermo-Calc Software Development Kits (SDKs). The database is compatible and recommended for use in combination with the TCS Solder Alloy Solutions Database (TCSLD).

Used together with the Diffusion Module (DICTRA) and a thermodynamic database for solder alloys (e.g. TCSLD5), the database can be used to study diffusion-controlled phenomena in solder/substrate systems, such as solidification, growth of interfacial compounds, dissolution of substrates, interdiffusion, and much more.

Similarly, when combined with the Precipitation Module (TC-PRISMA), it is suitable to simulate concurrent nucleation, growth, and coarsening of precipitates in solder alloys.

> MOBSLD: TCS Solder Alloy Solutions Mobility Database Revision History. The current version of the database is MOBSLD2. See the link for any subversion release details.

The CALPHAD Method

The Thermo-Calc databases are developed with the CALPHAD approach based on various types of experimental data and theoretical values (e.g. those from first-principles calculations). It is based on the critical evaluation of binary, ternary, and for some databases, important higher order systems. This enables predictions to be made for multicomponent systems and alloys of industrial importance. Among these, the thermodynamic database is of fundamental importance.

> Learn more on our website about the CALPHAD Method and how it is applied to the Thermo-Calc databases.

Additional Resources

> Go to the Solder Alloys Databases page on our website where you can access an examples collection and the technical information plus learn more about the compatible thermodynamic database. Also explore further applications of Thermo-Calc to solders including links to resources such as examples, publications, and more.

MOBSLD2: Elements and Phases

Included Elements

There are 24 elements included in the most recent version of the database.

Ag	Al	Au	Bi	Ca	Cd	Co	Cu	Ga	Ge
Hf	In	Mg	Mn	Ni	Pb	Pd	Pt	Sb	Si
Sn	Ti	Zn	Zr						

Included Phases

Solution Phases

Solution Phases			
FCC_A1	HCP_A3	BCT_A5	DIAMOND_A4
RHOMBOHEDRAL_A7	LIQUID		

Compounds

Compounds				
Ni3SN4	CU2IN_LT	CU7IN3	ALCU_ZETA	CU5ZN8_GAMMA
CU3SN	CU6SN5_HT_NIAS	AG3SN_L60_CU3TI		

📄 The phases have diffusion data included in the database. You can include other phases in a diffusion simulation. However, these other phases are treated as so-called diffusion NONE, i.e. there is no diffusion considered in these other phases. Any phase not listed above is automatically entered as diffusion NONE (in Console Mode in the DICTRA module or in Graphical Mode with the Diffusion Module (DICTRA) and/or Precipitation Module (TC-PRISMA)), as long as a thermodynamic description for the phases is retrieved prior to reading data from the mobility database.

Limits

As in the spirit of the CALPHAD method, predictions can be made for multicomponent systems by extrapolation into multicomponent space of data critically evaluated and assessed based on binary, ternary and in some cases higher order systems. However, critical calculations must always be verified by equilibrium experimental data; it is the user's responsibility to verify the calculations but Thermo-Calc Software AB is interested to know about any significant deviations in order to improve any future release.

Limits

MOBSLD2: Assessed Systems

LIQUID

Assessed data for LIQUID in 18 binary and 6 ternary systems are included.

Binary

Binary Assessed Systems (LIQUID)				
Ag-Cu	Ag-In	Ag-Pb	Ag-Sb	Ag-Sn
Al-Cu	Al-Mg	Al-Ni	Al-Si	Al-Zn
Bi-Pb	Bi-Sn	Cu-Sn	Ln-Sn	Mg-Zn
Ni-Si	Pb-Sn	Sb-Sn		

Ternary

Ternary Assessed Systems (LIQUID)					
Ag-Bi-Pb	Ag-Bi-Sn	Ag-Pb-Sn	Ag-Sb-Sn	Al-Mg-Si	Bi-Pb-Sn

FCC_A1

Assessed data for FCC_A1 in 44 binary, 21 ternary, and 4 quaternary systems are included.

Binary

Binary Assessed Systems (FCC_A1)						
Ag-Al	Ag-Au	Ag-Co	Ag-Cu	Ag-Ge	Ag-Mg	Ag-Mn
Ag-Pd	Ag-Sn	Ag-Zn	Al-Co	Al-Cu	Al-Mg	Al-Ni
Al-Pt	Al-Si	Al-Ti	Al-Zn	Al-Zr	Au-Co	Au-Cu
Au-Ni	Au-Pt	Co-Cu	Co-Mn	Co-Pd	Co-Pt	Co-Ti
Cu-Ge	Cu-Mg	Cu-Mn	Cu-Ni	Cu-Pt	Cu-Si	Cu-Sn
Cu-Zn	Mn-Ni	Ni-Ge	Ni-Pd	Ni-Si	Ni-Sn	Ni-Ti

Binary Assessed Systems (FCC_A1)							
Ni-Zn	Pd-Pt						

Ternary

Ternary Assessed Systems (FCC_A1)					
Ag-Al-Cu	Ag-Al-Zn	Ag-Au-Cu	Ag-Cu-Sn	Al-Cu-Mg	Al-Cu-Mn	Al-Cu-Ni
Al-Cu-Si	Al-Cu-Zn	Al-Mg-Si	Al-Mg-Zn	Al-Mn-Ni	Cu-Mn-Ni	Cu-Mn-Zn
Cu-Ni-Si	Cu-Ni-Zn	Ag-Cu-Ni	Ag-Sn-Zn	Cu-Sn-Zn	Cu-Ni-Sn	Cu-Al-Sn

Quaternary

Quaternary Assessed Systems (FCC_A1)			
Al-Cu-Mg-Zn	Cu-Mn-Ni-Zn	Cu-Ni-Al-Sn	Cu-Ni-Al-Zn

DIAMOND_A4

Assessed data for DIAMOND_A4 in 1 binary is included.

Binary

Binary Assessed Systems (DIAMOND_A4)
Ge-Si

HCP_A3

Assessed data for HCP_A3 in 5 binary and 1 ternary systems are included.

Binary

Binary Assessed Systems (HCP_A3)				
Ag-Ti	Cu-Ti	Mg-Ga	Mg-Ag	Mg-Zn

Ternary

Ternary Assessed Systems (HCP_A3)
Mg-Ag-Zn

MOBSLD: TCS Solder Alloy Solutions Mobility Database Revision History

Current Database Version

Database name (acronym):	**TCS Solder Alloy Solutions Mobility Database (MOBSLD)**
Database owner:	**Thermo-Calc Software AB**
Database version:	**2.0**
First release:	**MOBSLD1 was released with 2017a**

Changes in the Most Recent Database Release

MOBSLD1 to MOBSLD2

Software release version: 2024b (June 2024)

- Three new elements: Hf, Ti, and Zr are added to make a 24 element framework.
- Updated compounds: Ni3SN4, CU2IN_LT, CU7IN3, ALCU_ZETA, CU5ZN8_GAMMA, and CU3SN.
- Added self- and impurity diffusivity data for Hf-X, Ti-X, and Zr-X binary systems.
- The description of diffusion in the LIQUID phase is greatly improved.
- The HCP_A3 phase is restored as the lattice stability of Zn, and the interaction parameters are adjusted accordingly.

Updated Systems

- FCC_A1

    - Binary: Ag-Ge, Ag-Mg, Ag-Mn, Ag-Pd, Al-Pt, Al-Ti, Al-Zr, Au-Pt, Co-Mn, Co-Ti, Cu-Ge, Ni-Pd, Ni-Ti, and Pd-Pt.
    - Ternary: Ag-Cu-Ni, Ag-Sn-Zn, Cu-Sn-Zn, Cu-Ni-Sn, Cu-Al-Ni and Cu-Al-Sn.
    - Quaternary: Cu-Ni-Al-Sn and Cu-Ni-Al-Zn.

- HCP_A3

    - Binary: Ag-Mg, Ag-Ti, Cu-Ti, Mg-Ga, and Mg-Zn.
    - Ternary: Mg-Ag-Zn