TCS Cu-alloys Mobility Database (MOBCU5)

Technical Information

Available Starting with Thermo-Calc Version 2022b

Document created 6/3/2022

Contents

MOBCU5: TCS Cu-based Alloys Mobility Database

TCS Cu-based Alloys Mobility Database (MOBCU) is a kinetic database containing mobility data for Cu-based alloys. Data is present in a format suitable for simulation of diffusion controlled phenomena using the add-on Diffusion Module (DICTRA) and/or Precipitation Module (TC-PRISMA), and/or for use together with any Thermo-Calc programming interface.

MOBCU5 is intended for use in combination with the TCCU5 (TCS Cu-based Alloys) thermodynamic database.

Together with the Diffusion Module (DICTRA) and a thermodynamic database for Cu-alloys (e.g. TCCU) use the MOBCU5 database to study diffusion-controlled phenomena in copper alloys, e.g. microsegregation during solidification, homogenization kinetics, growth/dissolution kinetics of precipitates, interdiffusion, and so forth. You can also use it with the Precipitation Module (TC-PRISMA) to simulate concurrent nucleation, growth, and coarsening of precipitates in Cu-based alloys.

MOBCU: TCS Copper Mobility Database Revision History. The current version of the database is MOBCU5. See the link for any subversion release details.

Included Elements

There are 32 elements included in the most recent version of the database.

Ag	Al	Au	As	B	Be	Bi	C	Ca	Cd
Ce	Co	Cr	Cu	Fe	Ge	La	Mg	Mn	Mo
Nb	Ni	O	P	Pb	Pt	Se	Si	Sn	Ti
Zn	Zr								

Included Phases

This database has **FCC_A1** and **LIQUID** phases.

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.

Assessed Systems

FCC_A1

The database contains assessed impurity diffusion data in Cu for all 31 alloying elements. Included are the complete and critical assessments for `FCC_A1` in 40 binary systems, 32 ternary systems, and 3 quaternary systems.

Binary

FCC_A1 Binary Assessed Systems							
Ag-Al	Ag-Au	Ag-Cu	Ag-Sn	Al-Cr	Al-Cu	Al-Fe	Al-Mg
Al-Mn	Al-Ni	Al-Pt	Al-Si	Al-Ti	Al-Zn	Au-Cu	Be-Cu
Co-Cu	Co-Fe	Co-Mn	Co-Ni	Co-Pt	Cr-Fe	Cr-Ni	Cu-Fe
Cu-Mg	Cu-Mn	Cu-Ni	Cu-Si	Cu-Sn	Cu-Ti	Cu-Zn	Fe-Mn
Fe-Ni	Mn-Ni	Mn-Zn	Mo-Ni	Ni-Pt	Ni-Si	Ni-Ti	Ni-Zn

Ternary

FCC_A1 Ternary Assessed Systems							
Ag-Al-Cu	Ag-Au-Cu	Al-Cr-Ni	Al-Cu-Fe	Al-Cu-Mg	Al-Cu-Mn	Al-Cu-Ni	Al-Cu-Si
Al-Cu-Sn	Al-Cu-Zn	Al-Mn-Ni	Al-Ni-Pt	Al-Ni-Ti	C-Cr-Fe	C-Cr-Ni	C-Fe-Ni
Co-Cu-Mn	Co-Cu-Ni	Co-Fe-Ni	Cr-Cu-Ni	Cr-Fe-Ni	Cu-Fe-Mn	Cu-Fe-Ni	Cu-Mn-Ni
Cu-Mn-Si	Cu-Mn-Zn	Cu-Mo-Ni	Cu-Ni-Si	Cu-Ni-Sn	Cu-Ni-Ti	Cu-Ni-Zn	Cu-Sn-Zn

Quaternary

FCC_A1 Quaternary Assessed Systems
Cu-Al-Ni-Sn
Cu-Mn-Ni-Zn
Cu-Ni-Al-Zn

LIQUID

Data for diffusion in LIQUID Cu alloys are also assessed or estimated for all elements in the database. Complete and critical assessments of 15 binary systems for the LIQUID phase are included.

Binary

LIQUID Binary Assessed Systems							
Ag-Cu	Ag-Sn	Al-Ce	Al-Cu	Al-Mg	Al-Ni	Al-Si	Al-Zn
Ce-Cu	Cu-Sn	Fe-Mn	Fe-Si	Ni-P	Ni-Si	Pb-Sn	

Limits

The database is applicable for most commercial Cu-based alloys; care should be taken with alloys including high amounts of alloying elements.

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.

Additional Resources

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

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

MOBCU: TCS Copper Mobility Database Revision History

Current Database Version

Database name (acronym):	**TCS Cu-based Alloys Mobility Database (MOBCU)**
Database owner:	**Thermo-Calc Software AB**
Database version:	**5.0**
First release:	**MOBCU1 was originally released with 2016a (June)**

Changes in the Most Recent Database Release

MOBCU4 to MOBCU5

Software release version: 2022b (June 2022)

This database is compatible with TCS Cu-based Alloys Database (TCCU5).

- Two new elements: Ce and La.
- The self-diffusion and related impurity diffusion data for Ce and La were included in both FCC_A1 and LIQUID phases.
- The complete and critical assessments for the following systems are implemented:
    - FCC Cu-Ti, Co-Mn, Ni-Mo, Cu-Ni-Mo, Cu-Ni-Ti, Cu-Co-Mn, Cu-Mn-Si, Cu-Ni-Al-Zn and Cu-Ni-Al-Sn.
    - Liquid: Al-Ce and Cu-Ce.
- The description for FCC Ni-Ti is updated.

Previous Releases

MOBCU3 to MOBCU4

Software release version: 2021b (June 2021)

This database is compatible with TCS Cu-based Alloys Database (TCCU4).

The complete and critical assessments for FCC Cu-Al-Sn and Cu-Ni-Sn ternary systems and liquid Ni-P binary system are implemented. The description for FCC Cu-Al-Ni is updated.

MOBCU2 TO MOBCU3

Software release version: 2019b (June 2019)

This database is compatible with TCS Cu-based Alloys Database (TCCU3) and the update from MOBCU2 to MOBCU3 now contains data for the diffusion of the new element Ge in both FCC and liquid phases of Cu alloys.

MOBCU1 to MOBCU2

Software release version: 2017a (March 2017)

Two elements, Mo and O, are added in MOBCU2. The self-diffusion and related impurity diffusion data for Mo and O were included in both FCC_A1 and LIQUID phases. The complete and critical assessments for LIQUID Ag-Sn, Al-Ni, Al-Zn, Cu-Sn, Fe-Mn, Fe-Si and Pb-Sn binary systems are implemented. The description for LIQUID Ag-Cu has been updated.