MOBAL4: TCS Al-alloys Mobility Database

Database name:	TCS Al-alloys Mobility Database	*Database acronym:*	MOBAL
Database owner:	Thermo-Calc Software AB	*Database version:*	4.0

MOBAL4 is a kinetic database containing atomic mobility data for Al-based alloys. It is presented in a format 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 any Thermo-Calc programming interface by a user's own application computer program.

MOBAL4 is primarily intended for use in combination with the TCAL5 thermodynamic database, but is also compatible for use in combination with the SSOL or COST thermodynamic databases.

Applications

Together with the Diffusion Module (DICTRA) and a thermodynamic database for Al-alloys (e.g. TCAL5) the MOBAL4 database can be used to study several different phenomena of interest to aluminium alloys, such as e.g. microsegregation during solidification, homogenisation kinetics, growth/dissolution kinetics of precipitates, and much more. In a similar way, MOBAL4 is also suitable for simulating concurrent nucleation, growth, and coarsening of precipitates in Al alloys by using the Precipitation Module (TC-PRISMA).

Included Elements (35)

Ag Al B Be Bi C Ca Cd Ce Co Cr Cu Er Fe Ga Ge H
Hf In K La Li Mg Mn Na Ni Pb Sc Si Sn Sr Ti V Zn
Zr

Included Phases

FCC_A1 FCC_L12 LIQUID

Note that apart from the above phases for which diffusion data is indeed included in the database, other phases may also be included in a diffusion simulation. However, these other phases will be treated as so-called diffusion "NONE" phases, i.e. there will be no diffusion considered in such phases. Phases which are not listed above will automatically be entered as diffusion "NONE" phases in the DICTRA module in Thermo-Calc, provided a thermodynamic description for such phases has been retrieved prior to reading data from the mobility database.

Assessed Systems

MOBAL4 contains critically assessed self- and impurity diffusion data for the elements in the LIQUID, FCC_A1 and FCC_L12 phases on the basis of experimental information and empirical rules. Complete and critical assessments of the binary, ternary and quaternary systems (listed below) for the LIQUID, FCC_A1 and FCC_L12 phases have also been included. Diffusion data for the LIQUID phase has been assessed for systems where experimental data is available; otherwise the modified Sutherland equation was used for estimation.

Binary systems

FCC_A1

Ag-Al	Al-Cu	Al-Fe	Al-Mg	Al-Mn	Al-Ni	Al- Si	Al-Zn	Cu-Fe
Cu-Mg	Cu-Mn	Cu -Ni	Cu-Si	Cu-Zn	Fe-Mg	Fe-Mn	Fe-Ni	Fe-Si
Fe-Zn	Mg-Mn	Mg-Ni	Mg-Si	Mg-Zn	Mn-Ni	Mn-Si	Mn-Zn	Ni-Si
Ni-Zn	Si-Zn							

LIQUID

Al-Cu	Al-Ni	Al-Si	Al-Zn	Fe-Zn	Fe-Mn	Fe-Si	Ni-Si

Ternary systems

FCC_A1

Al-Cu-Fe	Al-Cu-Mg	Al-Cu-Mn	Al-Cu-Ni	Al-Cu-Si	Al-Cu-Zn	Al-Mg-Si	Al-Mg-Zn	Al-Mn-Ni
Al-Si-Zn	Cu-Fe-Mn	Cu-Fe-Ni	Cu-Mn-Ni	Cu-Mn-Zn	Cu-Ni-Si	Cu-Ni-Zn		

FCC_L12

Al-Fe-Ni

LIQUID

Al-Cu-Zn	Al-Fe-Ni	Al-Mg-Si

Quaternary systems

FCC_A1

Al-Cu-Mg-Zn	Cu-Mn-Ni-Zn

Limits

The database is applicable for most commercial Al-based alloys, and 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 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.

Scientific Models and References

See the Thermo-Calc Software reference list and reference library at: http://www.thermocalc.com/resources/