MOBAL3: TCS Al-alloys Mobility Database

Database name:	TCS Al-alloys Mobility Database	*Database acronym:*	MOBAL
Database owner:	Thermo-Calc Software AB	*Database version:*	3.0

MOBAL3 is a kinetic database containing mobility data for Al-based alloys present 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.

MOBAL3 is primarily intended for use in combination with the TCAl4 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. TCAL4) the MOBAL3 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, interdiffusion in Al-compounds, and much more. In a similar way, MOBAL3 is suitable for simulating concurrent nucleation, growth, and coarsening of precipitates in Al alloys by using the Precipitation Module (TC-PRISMA).

Included Elements (34)

Ag	Al	B	Be	Bi	C	Ca	Cd	Ce	Co	Cr	Cu	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 LIQUID

Note that apart from above phases for which diffusion data is indeed included in the database, then also other phases may be included in a diffusion simulation. However, these other phases will be treated as so-called diffusion "NONE", i.e. there will be no diffusion considered in such phases. Phases which are not listed above will automatically be entered as diffusion "NONE" 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

FCC_A1:

The database contains assessed impurity diffusion data in Al for all included elements. It also includes complete and critical assessments for FCC_A1 in the following binary systems.

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:

There is also assessed data for diffusion in liquid Al for Al, Cr, Cu, Fe, Ge, Mg, Mn, Ni, Si, Ti, V, and Zn. For remaining elements we use a simple estimate, i.e. $D = 1E\text{-}7 \bullet \exp^{(-30000/RT)}$.

Limits

The database is applicable for most commercial Al-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 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.