



Database name: ThermoTech Mg-based Alloys Database
Database acronym: TTMG4 **Database version:** 4.1
Database owner: ThermoTech
Database segment: Magnesium Based Alloys

Brief description

TTMG4 is a comprehensive database for Mg-alloys that can be used for all major types of commercial Mg-alloys ranging from pure Mg to complex commercial alloys.

Applications

Mg-based alloy design and engineering.

Included Elements

Al Ca Ce Cu Fe Gd La Mg Mn Nd Sc Si Sr Y Zn Zr

Included Phases

| | | | | |
|---------------|--------------|----------|-----------|-------------|
| AL11MN4 | AL4MN | BETA_MN | MG17SR2 | MGZN |
| AL11RE3_ALPHA | AL5CU2MG8SI6 | CU2MG | MG24Y5 | MGZN2 |
| AL2FE | AL5FE2 | DHCP | MG2CA | PHI_ALMGZN |
| AL2RE | AL6MN | FCC_A1 | MG2CU | Q_AL7CU3MG6 |
| AL2ZR | AL8FEMG3SI6 | FE | MG2SI | SILICON |
| AL3FE | AL8MN5 | HCP_A3 | MG2ZN3 | T_ALCUMGZN |
| AL3RE_D019 | ALPHA | LIQUID | MG3RE_D03 | |
| AL3ZR | ALPHA_MN | MG12RE | MG41RE5 | |
| AL4M_D13 | ALPHA_ZR | MG17AL12 | MG5GD | |

Assessed Systems

All phases have been critically assessed and treated by some appropriate thermodynamic models (e.g. the Sublattice Model for solid solutions and liquid mixture phases), which are applicable over a wide temperature-pressure-composition range.

Validation

TTMG4 is a sister database to TTAI and helps provides new insight into phase equilibria behaviour in complex Mg-alloys. Like TTAI it is well suited for use in the modelling of non-equilibrium solidification processes. As part of a validation process of the database, extensive comparison has been made between the simulated results and available experimental data for Mg-alloys. The database performs at accuracy close to the level expected of the experiments.

The Liquid and HCP-A3 phases are modeled as substitutional mixing phases, with the HCP-A3 phase corresponding to the Mg-rich solid solution. The other phases are often stoichiometric with respect to at least one element, although a number of other elements may mix in the phase. The nomenclature surrounding the various intermetallic phases can differ depending on which reference text is used as a basis.

The database can be used for predictions of all types of equilibria, gamma/gamma-prime, gamma-prime solvus, solidus/liquidus relations etc. Using the SCHEIL module in the TCC and TCW software, it is also possible to make solidification simulations which provide predictions for non-equilibrium micro-segregation, fs vs T plots, heat evolution etc. For more complex modeling, the calculations provide critical information which can otherwise only be found by the use of expensive experimental techniques.

Limits

Combinations of several critically-assessed systems can calculate and extrapolate higher-order multicomponent systems. Such extrapolations require experience and understanding and the producer or vendor should be contacted if problems occur. Critical calculations must always be verified by equilibrium experimental data; it is the user's responsibility to verify the calculations but Thermo-Calc Software is interested to know about any significant deviations in order to improve any future release.

Scientific Models & References

See the Thermo-Calc Software reference list available at: <http://www.thermocalc.com/Library.htm>