



Database name: ThermoTech Ni-based Superalloys Database
Database acronym: TTNI7 **Database version:** 7.0
Database owner: ThermoTech
Database segment: Nickel Based Superalloys

Brief description

TTNI7 is suitable for commercial Ni-based superalloys, high Fe-containing and single crystal Ni-based superalloys.

Applications

Ni-based superalloy design and engineering.

Included Elements

Al B C Co Cr Cu Fe Hf Mn Mo N Nb Ni O Re Ru Si
 Ta Ti W V Zr

Included Phases

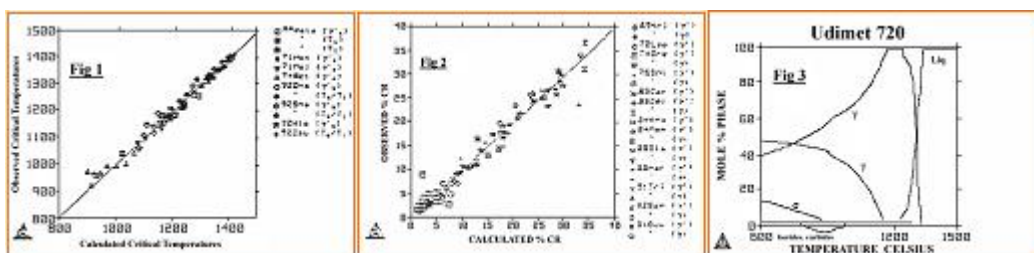
A4B_D1	G_PHASE	M2B_TETR	MB2_C32	P_PHASE
BCC_A2	GAMMA_PRIME	M2O3	MO_B2	PI_PHASE
CR3NI5SI2	GAS:G	M2SIO4	MU_PHASE	R_PHASE
CR5B3	GRAPHITE	M3B	MULLITE	SIGMA
CUB_A15	HCP_A3	M3B2_TETR	NI2M	SIO2
DELTA	LAVES	M3O4	NI3SI_H	SPINEL_AB2O4
DELTA_PRIME	LIQUID	M6C	NI5SI2	Z_PHASE
ETA	M23C6	M7C3	NIAL	
FCC_A1	M2B_ORTH	MB_ORTH	NIMO	

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, the Ideal Gas Model for gas mixture phase, etc), which are applicable over a wide temperature-pressure-composition range. TTNI7 include new work about Si containing alloys which has improved the predictions when higher Si contents are used. Extensive assessments on oxides based around the Ni-Al-Cr-Fe-Si-Ti-O system have been done.

Validation

During validation process of the TTNI7 database, extensive comparison has been made between the simulated results and available experimental data for superalloys (Figures 1 and 2). The database performs at an accuracy close to the level expected of the experiments themselves. The database can be used for predictions of all types of equilibria, such as γ/γ' , γ' solvus, solidus/liquidus relations (Figure 3 for U720 alloy as an example).



Using the SCHEIL module in the TCC and TCW software, it is also possible to make solidification simulations that provide predictions for non-equilibrium micro-segregation, like fs vs T plots and heat evolution. For more complex modeling, the calculations provide critical information that can otherwise only be found by expensive experimental techniques.

Limits

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/DOWNLOAD_AREA/References.html