Modelling Materials Properties & Behaviour

JMatPro

Version 15.0		Al alloys	Mg alloys	Cast irons	General steels	Stainless steels	Ni alloys	Co alloys	Ti alloys	Zr alloys	Solder alloys	Copper alloys
Phases	Temperature/Concentration stepping	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Isopleth	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Metastable phases	✓	✓									
Physical properties	Standard physical properties*	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Stacking fault energy				✓	✓	✓	✓				
	Gamma/Gamma' mismatch						✓					
	Magnetic permeability				✓							
Solidification	Phases and physical properties	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Back diffusion / Secondary dendrite arm spacing	✓	✓		✓	✓	✓	✓	✓	✓		
	Cooling curve	✓	✓	✓			✓	✓	✓	✓	✓	✓
	Cast strength	✓	✓	✓	✓							
	Homogenisation	✓	✓		✓	✓	✓	✓	✓	✓		
Mechanical properties**	O F H T5 T6 heat treatment strength	✓										
	Room temp. strength/hardness	✓			✓	✓	✓		✓			
	High temp. strength/hardness	✓			✓	✓	✓	✓	✓			
	Flow stress curves & rupture strength	✓	✓		✓	✓	✓	✓	✓			
	Creep and rupture life					✓	✓	✓	✓			
	Jominy hardenability / Grossmann critical Ø				✓							
	Cast Strength	✓	✓	✓	✓							
	Fatigue tool				✓	✓	✓	✓	✓			
	Forming limit diagram	✓	✓		✓	✓	✓	✓	✓			
	Processing map	✓			✓	✓	✓	✓				
	Fracture toughness	✓			✓				✓			
Phase transformations	TTT/CCT diagram	✓	✓	✓	✓	✓	✓	✓	✓	✓		
	TTA diagram				✓							
	Re-austenitisation phases and properties				✓							
	Plasticity coefficients				✓							
	Isothermal transformations	✓	✓		✓	✓	✓	✓	✓	✓		
	Energy changes			✓	✓	✓	✓		✓			
	Cooling transformations				✓				✓	✓		
	Martensite formation				✓	✓			✓			
	Stress induced martensite				✓	✓						
	Quenching and welding data				✓							
	Simultaneous carbide precipitation and strength				✓							
	Temp.-time-precipitation of M(C,N), MN, AlN				✓	✓						
	Tempering hardness and properties				✓							
	Gamma'/Gamma" coarsening						✓					
	Hot Rolling grain size/recrystallization/rolling force				✓							
	Evolution of microstructure & strength						✓					
Data export	Forging simulation data	✓			✓	✓	✓	✓	✓			
	Welding and heat treatment simulation data				✓							
	Solidification simulation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Other	Carburisation				✓	✓						
	C diffusion in weld				✓							
	Dissimilar metal welds	✓					✓		✓			
	Pitting resistance					✓						

* Specific heat – enthalpy - density - molar volume - thermal expansion coefficient - thermal conductivity - electrical conductivity/resistivity - surface tension - liquid viscosity/diffusivity- Poisson's ratio- Young's/shear/bulk modulus. These properties can be calculated during/after heat treatment or during solidification for the whole temperature range including in the liquid phase. When relevant, properties are given for each phase.   ** Proof stress, tensile stress and hardness are calculated at any temperature up to the melting point.   *** Data export is done both to specific formats used by third-party simulation software and to neutral ASCII files.