Modelling Materials Properties & Behaviour



Temperature/Concentration stepping	Version 14.0		٤	۸s	su	_	S	શ	s/	, s	ه		
Sopieth			Al alloys	Mg alloys	Cast irons	General	Stainless steels	Ni alloys	Co alloys	Ti alloys	Zr alloys	Solder	Copper alloys
Standard physical properties*	v	Temperature/Concentration stepping	√	√	√	✓	✓	✓	✓	✓	√	✓	√
Standard physical properties*	ase	Isopleth	✓	✓	√	√	✓	\	✓	√	✓	✓	√
Stacking fault energy	문	Metastable phases	✓	✓									
Phases and physical properties	_ S	Standard physical properties*	✓	✓	✓	✓	✓	>	✓	✓	✓	✓	✓
Phases and physical properties	ical rtie	Stacking fault energy				✓	✓	>	✓				
Phases and physical properties	hys ope	Gamma/Gamma' mismatch						>					
Back diffusion / Secondary dendrite arm spacing	Prd	Magnetic permeability				✓							
No First T6 heat treatment strength	_	Phases and physical properties	✓	✓	✓	✓	✓	>	✓	✓	✓	✓	✓
No First T6 heat treatment strength	₽ ţi	Back diffusion / Secondary dendrite arm spacing	✓	✓		✓	✓	>	✓	✓	✓		
No First T6 heat treatment strength	Lica Lica	Cooling curve	✓	✓	✓			✓	✓	✓	✓	✓	✓
No First T6 heat treatment strength	Ē	Cast strength	✓	✓	✓	✓							
Room temp. strength/hardness	S	Homogenisation	✓	✓		✓	✓	✓	✓	✓	✓		
High temp. strength/hardness		O F H T5 T6 heat treatment strength	✓										
Fracture toughness	_	Room temp. strength/hardness	✓			✓	✓	✓		✓			
Fracture toughness	*	High temp. strength/hardness	√			√	√	√	√	√			
Fracture toughness	rtie	Flow stress curves & rupture strength	✓	✓		✓	✓	>	✓	✓			
Fracture toughness	be	Creep and rupture life					✓	>	✓	✓			
Fracture toughness	pro	Jominy hardenability / Grossmann critical Ø				✓							
Fracture toughness	Ca	Cast Strength	✓	1	✓	✓							
Fracture toughness	Jan	Fatigue tool				✓	✓	√	✓	✓			
Fracture toughness	ect	Forming limit diagram	✓	✓		✓	✓	>	✓	✓			
TTT/CCT diagram	Σ	Processing map	✓			✓	✓	>	✓	✓			
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-recipitation of M(C,N), MN, AIN Tempering hardness and properties Gamma'/Gamma" coarsening Hot Rolling grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data V V V V V V V V V V V V V V V V V V V		Fracture toughness	✓			✓				✓			
Re-austenitisation phases and properties Plasticity coefficients John John John John John John John John		TTT/CCT diagram	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Plasticity coefficients Isothermal transformations Energy changes Cooling transformations Martensite formation Martensite formation Stress induced martensite Quenching and welding data Simultaneous carbide precipitation and strength Temptime-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 Forging simulation data Solidification simulation data Solidification simulation Carburisation Y V V V V V V V V V V V V V V V V V V		TTA diagram				✓							
Isothermal transformations		Re-austenitisation phases and properties				✓							
Energy changes Cooling transformations Martensite formation Stress induced martensite Quenching and welding data Simultaneous carbide precipitation and strength Temptime-precipitation of M(C,N), MN, AIN Tempering hardness and properties Gamma'/Gamma" coarsening Hot Rolling grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data V V V V V V V V V V V V V V V V V V V		Plasticity coefficients				✓							
Tempering hardness and properties Gamma'/Gamma" coarsening Hot Rolling grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data Welding and heat treatment simulation data Solidification simulation Carburisation Tempering hardness and properties	S	Isothermal transformations	✓	✓		✓	✓	✓	✓	✓	✓		
Tempering hardness and properties Gamma'/Gamma" coarsening Hot Rolling grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data Welding and heat treatment simulation data Solidification simulation Carburisation Tempering hardness and properties	io	Energy changes			✓	✓	✓	>		✓			
Tempering hardness and properties Gamma'/Gamma" coarsening Hot Rolling grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data Welding and heat treatment simulation data Solidification simulation Carburisation Tempering hardness and properties	nat	Cooling transformations				✓				✓	✓		
Tempering hardness and properties Gamma'/Gamma" coarsening Hot Rolling grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data Welding and heat treatment simulation data Solidification simulation Carburisation Tempering hardness and properties	forr	Martensite formation				✓	✓			✓			
Tempering hardness and properties Gamma'/Gamma" coarsening Hot Rolling grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data Welding and heat treatment simulation data Solidification simulation Carburisation Tempering hardness and properties	Sue	Stress induced martensite				✓	✓						
Tempering hardness and properties Gamma'/Gamma" coarsening Hot Rolling grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data Welding and heat treatment simulation data Solidification simulation Carburisation Tempering hardness and properties	tr	Quenching and welding data				✓							
Tempering hardness and properties Gamma'/Gamma" coarsening Hot Rolling grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data Welding and heat treatment simulation data Solidification simulation Carburisation Tempering hardness and properties	lase	Simultaneous carbide precipitation and strength				✓							
Gamma'/Gamma" coarsening Hot Rolling grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data Welding and heat treatment simulation data Solidification simulation Carburisation V V V V V V V V V V V V V	ā	Temptime-precipitation of M(C,N), MN, AIN				1	✓						
Hot Rolling grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data Welding and heat treatment simulation data Solidification simulation Carburisation Welding and heat treatment simulation Carburisation The streatment is the streatment of the streatment is the		· · · · · · · · · · · · · · · · · · ·				✓							
grain size/recrystallization/rolling force Evolution of microstructure & strength Forging simulation data Welding and heat treatment simulation data Solidification simulation Carburisation Y V V V V V V V V V V V V								✓					
Evolution of microstructure & strength Forging simulation data Welding and heat treatment simulation data Solidification simulation Carburisation V V V V V V V V V V V V V						_ ✓							
Welding and heat treatment simulation data Solidification simulation Carburisation Welding and heat treatment simulation data								√					
Carburisation	٠	Forging simulation data	√			√	√	√	√	√			
Carburisation	por	Welding and heat treatment simulation data				√							
	e D	Solidification simulation	√	√	√	√	√	√	√	√	√	√	✓
C diffusion in weld Dissimilar metal welds		Carburisation				√	√						
Dissimilar metal welds	7	C diffusion in weld				√							
	Oth	Dissimilar metal welds	√					√		√			
Pitting resistance	- -	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.