

As – Fe (Arsenic – Iron)

Phase diagram

A thermodynamic assessment of the As-Fe system has been performed by Pei et al. [94 Pei] using an ionic two-sublattice model of the liquid alloys. The resulting phase diagram is given in Fig. 1. To show more clearly the phase equilibria in the neighbourhood of the intermediate phase As_2Fe_3 , this regions are reproduced in an enlarged version in Fig. 2.

By rapid cooling a solid solution (α - Fe) transforms to lath-shaped metastable martensite [77 Boz].

The γ -loop at least is shown in Fig. 3.

A short discussion is given by [Massalski].

Crystal structure

Crystal structure data are collected in Table 1.

Table 1. As–Fe. Crystallographic data of intermediate phases [91 Oka].

Phase	Composition [at% Fe]	Structure	Prototype	Lattice parameters [nm]			Reference
				<i>a</i>	<i>b</i>	<i>c</i>	
As_2Fe	33	ort	FeS_2	0.526	0.593	0.285	[32 Bue]
AsFe	50	ort	marcasite				
As_2Fe_3	57 ... 63		MnP	0.548	0.349	0.612	[28 Hag]
AsFe_2	66.2	tet	Cu_2Sb	0.3634		0.5985	[29 Hag]
$\text{As}_5\text{Fe}_{12}$	70.6	hex		0.67855		1.631	[83 Maa]
(high pressure)							

Thermodynamics

On the basis of calorimetrically determined reaction enthalpies Wypartowicz et al. [95 Wyp] have calculated enthalpies of mixing of liquid As-Fe alloys. The results are plotted in Fig. 4.

In the course of the above mentioned assessment thermodynamic properties for liquid alloys have been calculated. The obtained thermodynamic activities are plotted in Fig. 5 and Fig. 6, the enthalpies of mixing in Fig. 7. The entropies of mixing are given in Fig. 8. It should be mentioned that Botor et al. [91 Bot] in the limited concentration area between 20 and 35 at% As have determined thermodynamic activities on the basis of vapor pressure measurements. The results are compatible with Fig. 5.

Figures

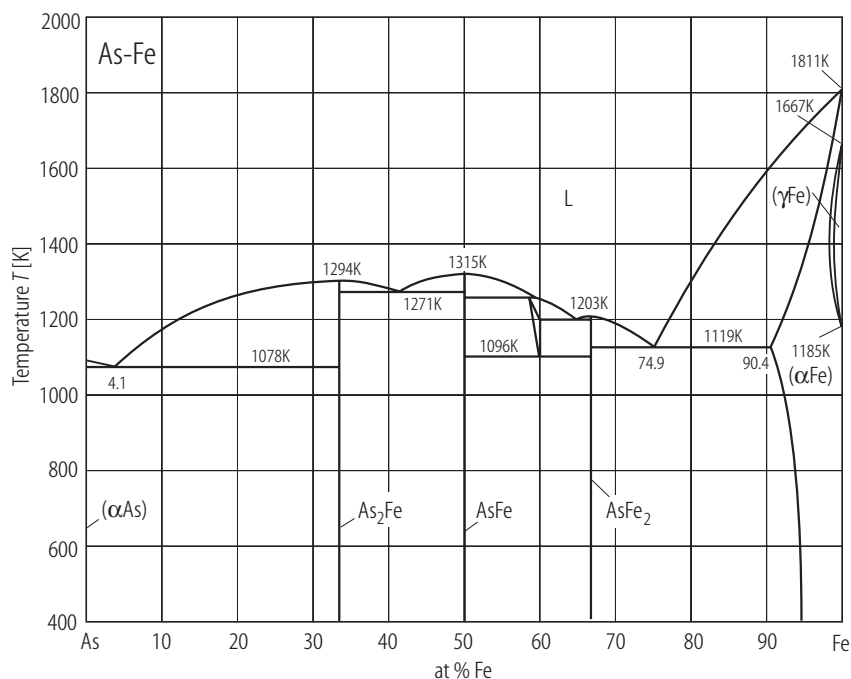


Fig. 1. As-Fe. Calculated phase diagram [94 Pei].

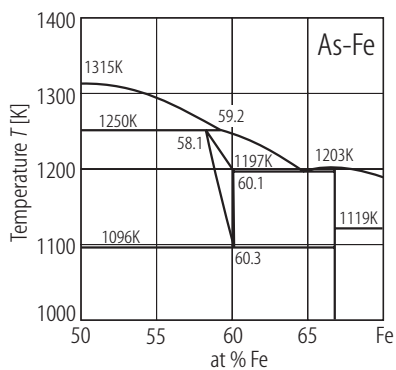
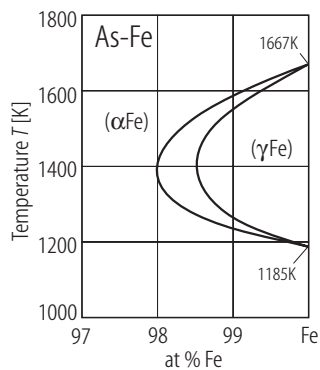


Fig. 2. As-Fe. Partial phase diagram in an enlarged version [94 Pei].

Fig. 3. As-Fe. The γ -loop in the As-Fe system [94 Pei].

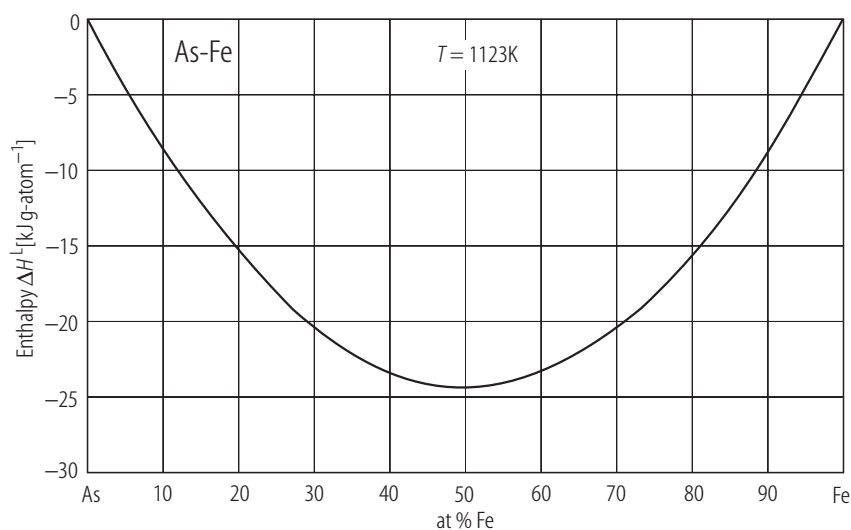


Fig. 4. As-Fe. Experimentally determined enthalpies of mixing in liquid alloys [95 Wyp].

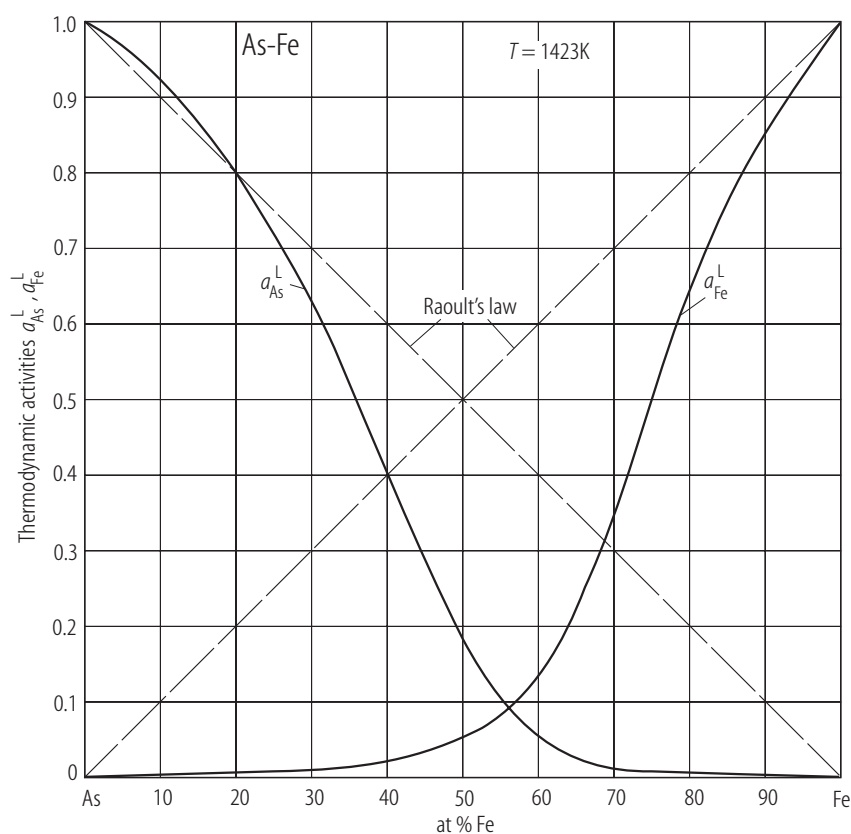


Fig. 5. As-Fe. Thermodynamic activities in liquid alloys [94 Pei].

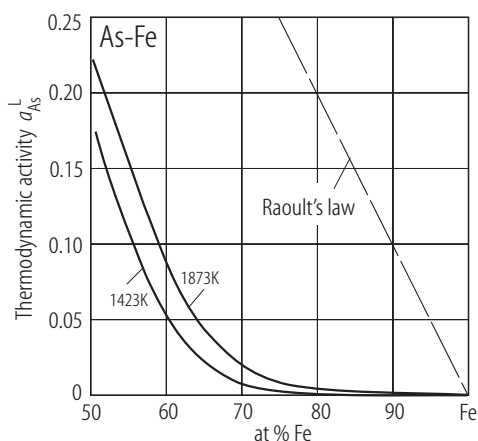


Fig. 6. As-Fe. Thermodynamic activities in liquid alloys with concentrations < 50 at% As [94 Pei].

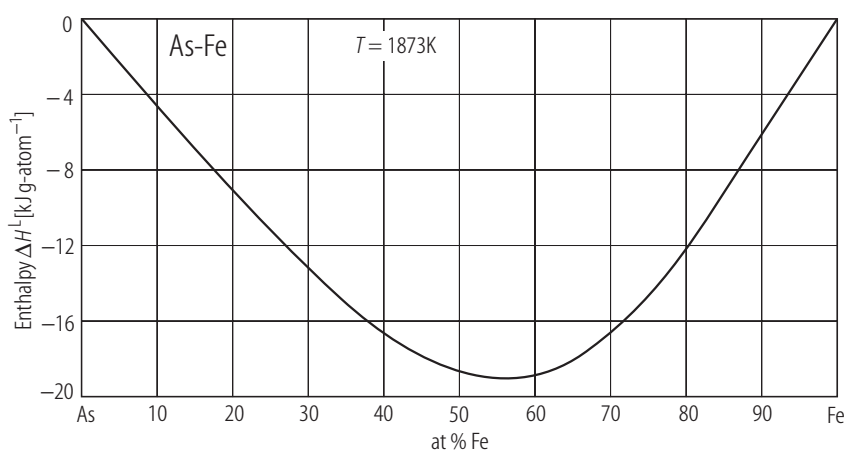


Fig. 7. As-Fe. Calculated enthalpies of mixing in liquid alloys [94 Pei].

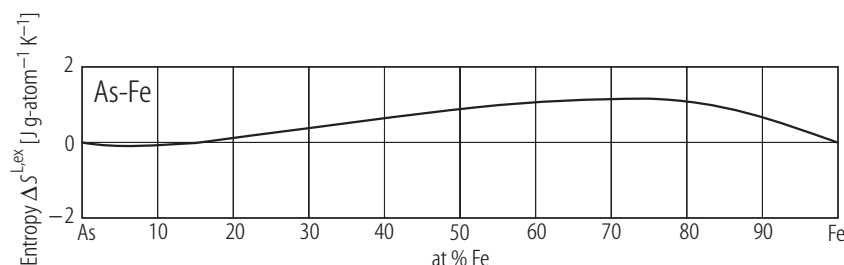


Fig. 8. As-Fe. Calculated entropies of mixing in liquid alloys [94 Pei].

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