In-Mg (Indium-Magnesium)

Phase diagram

Experimental determinations of phase equilibria have been done by Raynor [48Ray1], Graham et al. [57Gra1], Ino et al. [65Ino1], Hiraga et al. [68Hir1], Pickwick et al. [69Pic1], Watanabe [75Wat1], but especially thorough investigations have been performed by Hume-Rothery et al. [38Hum1] (thermal analysis, metallographic methods) and Feschotte [76Fes1] (differential thermal analysis, X-ray diffractography). Mostly on the basis of results from the latter two authors, Nayeb-Hashemi et al. [85Nay1] have constructed an assessed phase diagram, which was the basis of Fig. 1.

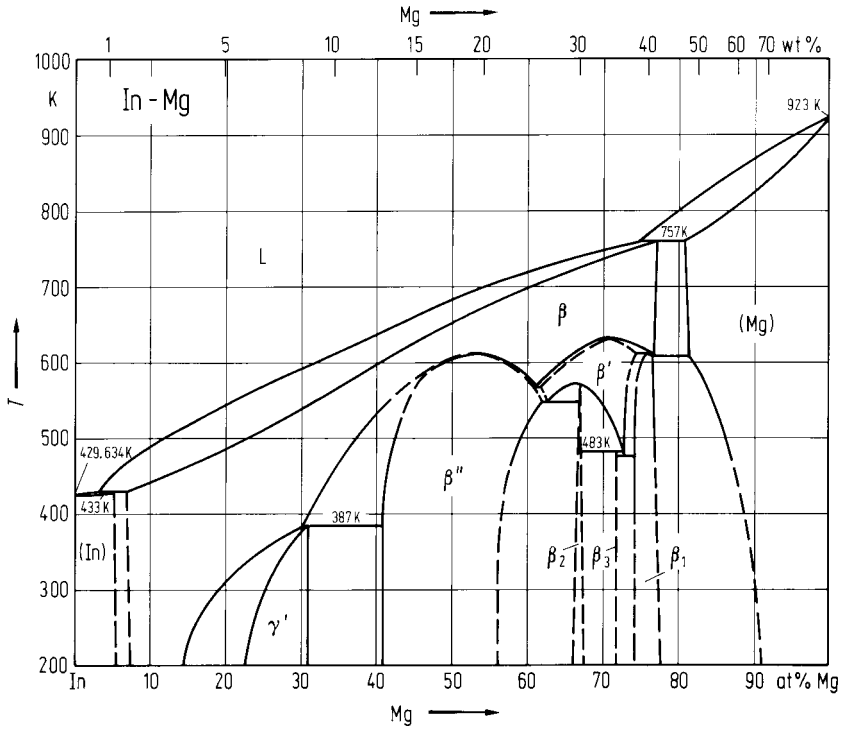

Fig. 1. In-Mg. Phase diagram.

Crystal structure

The lattice parameters of fc tetragonal (In) solid solutions have been determined by Hiraga et al. [68Hir1] at room temperature. The data obtained are plotted in Fig. 2.

The lattice parameters of cubic superstructure phase (Cu_3Au-type) have been measured by Hiraga et al. [68Hir1]. The results are given in Fig. 3. In the same Fig. 3 are also plotted the lattice paramters of βphase (fcc, with random distribution of the atoms). These lattice parameters have been determined by Hiraga et al. [68Hir1], too.

Lattice parameters of β", tetragonal CuAuI-type, as determined by Hiraga et al. [68Hir1], are given in Fig. 4.

For (Mg) solid solutions several times lattice parameters have been determined: Hume-Rothery et al.

[40Hum1], Raynor [42Ray1], Busk [50Bus1], von Batchelder et al. [57Bat1] and Hardie et al. [59Har1]. The results obtained by Hume-Rothery et al. [40Hum1] are plotted in Fig. 5.

Crystallographic data of intermediate phases with narrow homogeneity range are listed in Table 1.

Table 1. In-Mg. Crystal structure and lattice parameters of intermediate phases.

Phase	Structure	Type	*a* [nm]	*b* [nm]	*c* [nm]	Ref.
β_1	hex		0.6323		3.1060	75Wat1, 63Sch2
β_2	hex	Mg_2Tl	0.827		0.342	63Sch2
β_3	orth	Mg_5Ga_2	1.425	0.737	0.618	75Wat1

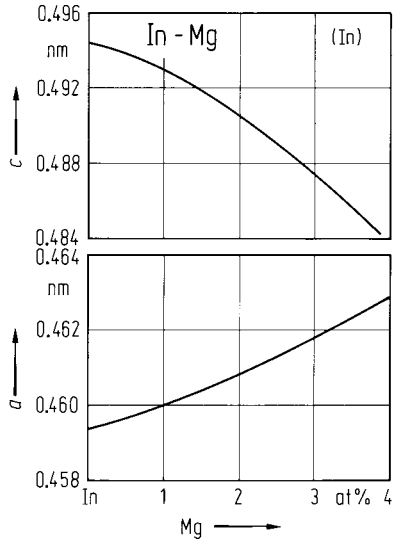

Fig. 2. In-Mg. Lattice parameters for fct (In) solid solution.

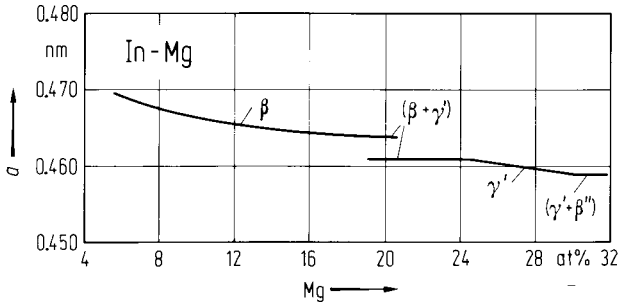

Fig. 3. In-Mg. Lattice parameter for fcc phases β (Cu-type) and γ' (Cu_3Au-type).

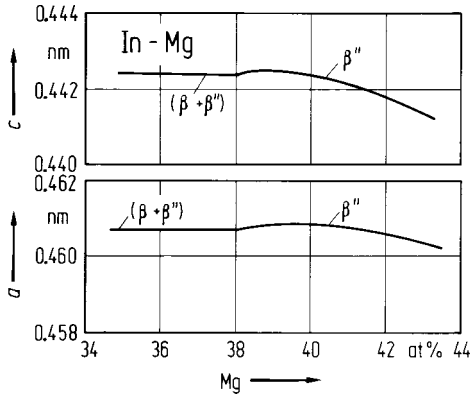

Fig. 4. In-Mg. Lattice parameters for tetragonal (CuAuI-type) phase β".

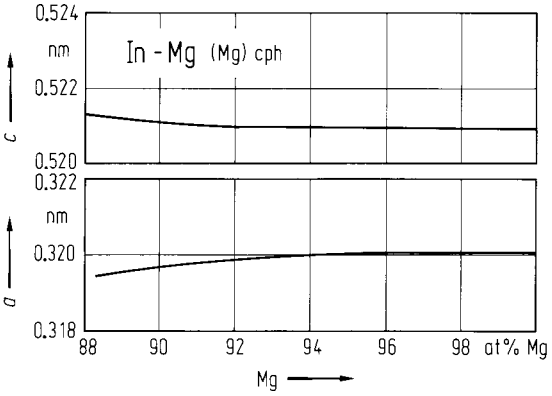

Fig. 5. In-Mg. Lattice parameters for cph (Mg) solid solution.

Thermodynamics

Thermodynamic data of In-Mg alloys have been determined several times using different methods. Hultgren et al. [73Hul1] has evaluated the most of the works and has selected most reliable values. The results obtained by Nebell [70Neb1] and by Moser et al. [77Mos1] are in agreement with results of evaluation by [73Hul1]. The data from the latter authors are given in Fig. 6 (enthalpy of mixing, ΔH^{L}), Fig. 7 (excess entropy of mixing, $\Delta S^{L,ex}$) and in Fig. 8 (isotherms of thermodynamic activities).

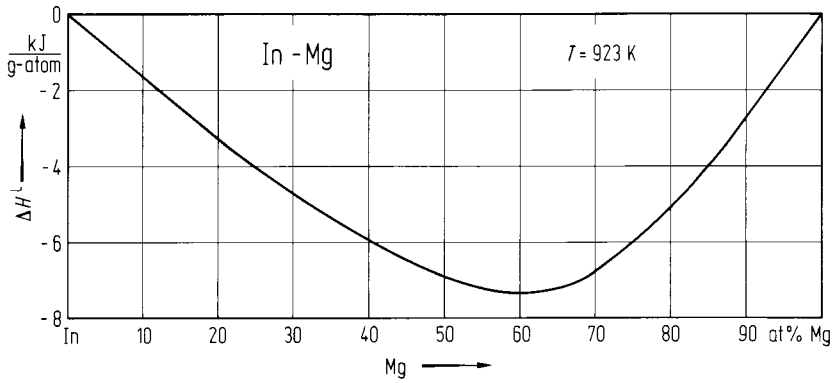

Fig. 6. In-Mg. Enthalpy of mixing for liquid alloys at 923 K.

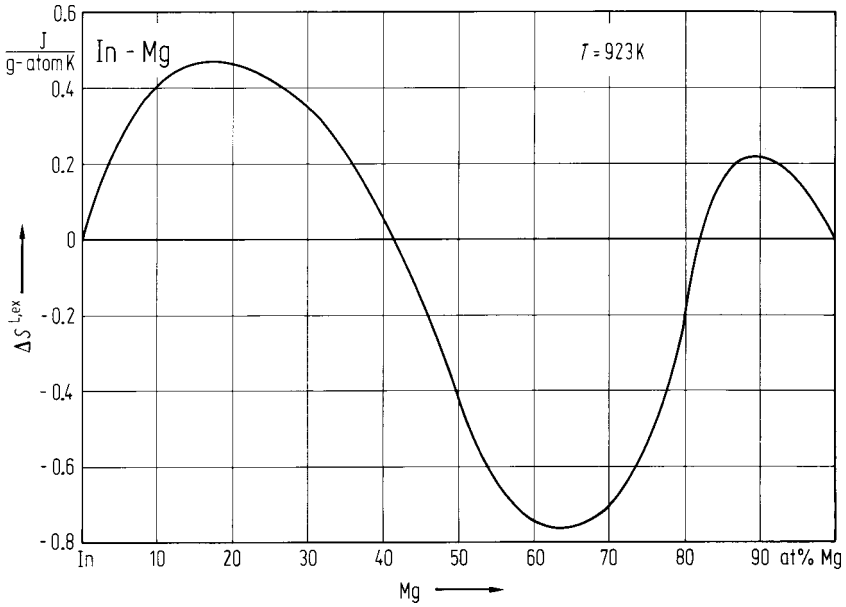

Fig. 7. In-Mg. Excess entropy of mixing for liquid alloys at 923 K.

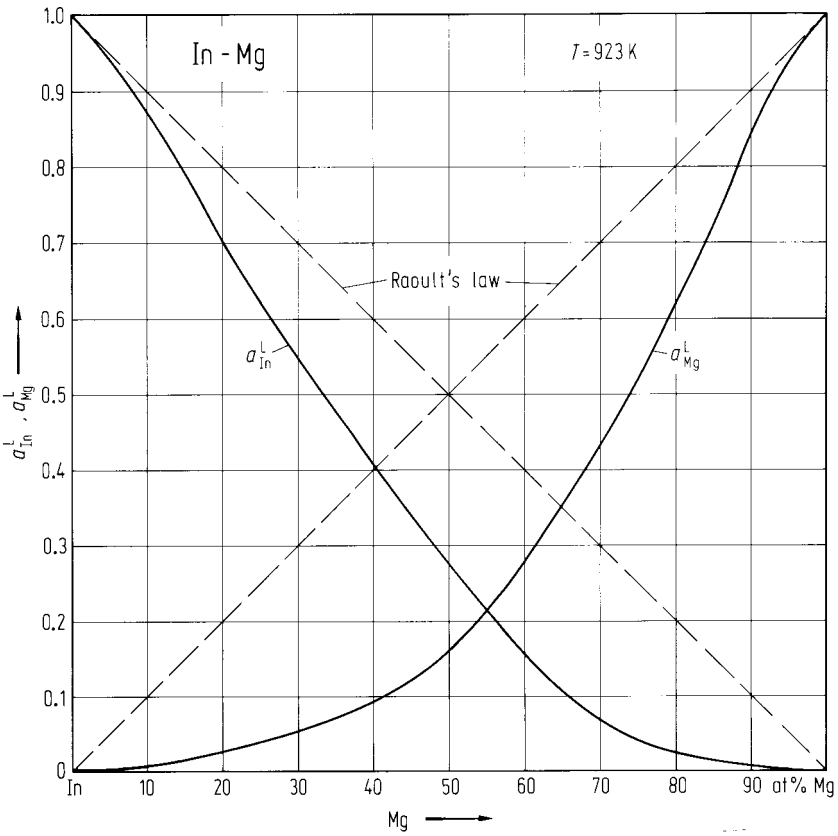

Fig. 8. In-Mg. Thermodynamic activities for liquid alloys at 923 K.

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