

Ag – X binary systems

Ag – Al (Silver – Aluminum)

Phase diagram

On the basis of phase equilibria and thermodynamic data published up to now, Lim et al. [95 Lim] have calculated an assessed phase diagram, which is given in Fig. 1. The results obtained are compared there with a phase diagram published by Spencer et al. [87 Spe]. The agreement between the calculated and the experimentally determined phase diagram (see [87 Spe]) is, as [95 Lim] pointed out, within the experimental error.

Earlier investigations of Al-rich solid solutions have indicated a metastable miscibility gap ([62 Bau], [86 Osa]). Completing these results by field ion probe analysis, Al-Kassab et al. [93 Al-K] have constructed more accurately this miscibility gap. It is shown in Fig. 2.

As Al-Kassab et al. [93 Al-K] pointed out investigating the early stages of precipitation at 97 at% Al, on cooling to temperature (a) (see Fig. 2) the metastable phase ϵ occurs. On further cooling to (b) (see Fig. 2) ϵ transforms into η , which is metastable, too. This transformation seems to be an order-disorder transition.

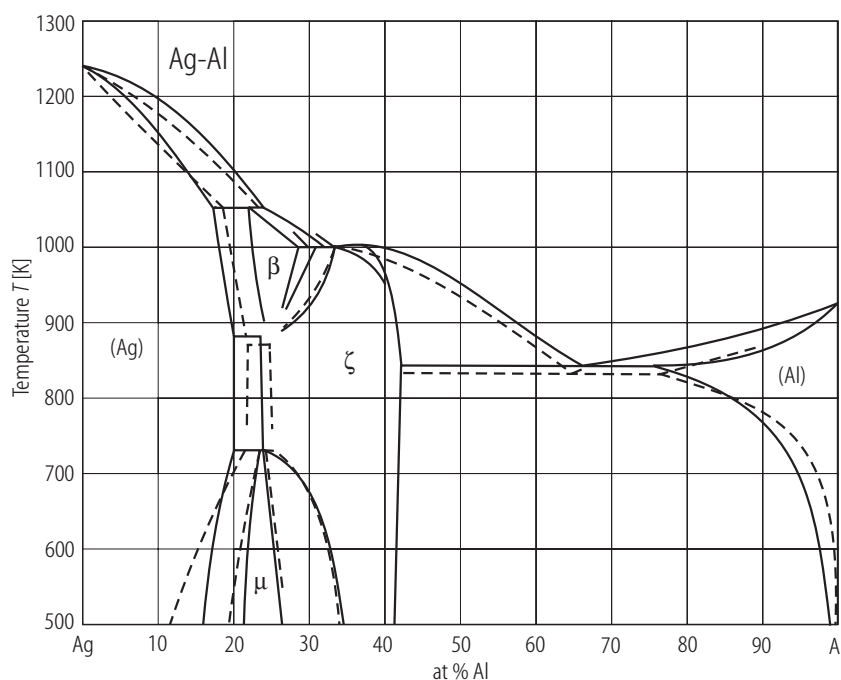


Fig. 1. Ag-Al. Assessed phase diagram Ag-Al [95 Lim].

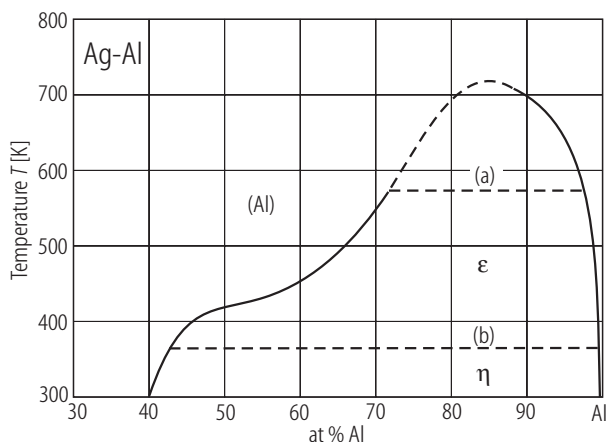


Fig. 2. Ag-Al. Miscibility gap in the solid state [62 Bau].

Crystal structure

Using X-ray diffraction methods, Yuantao et al. [92 Yua] have determined again the lattice constants of (Ag) solid solutions. The results obtained are comparable to those published earlier by [Pearson].

Thermodynamics

By the optimizing procedure of thermodynamic data Lim et al. [95 Lim] obtained thermodynamic activities of Al in liquid alloys which, at 1613 K and 1173 K, are in excellent agreement with experimentally determined results obtained by Belton et al. [69 Bel] and Massart et al. [70 Mas], respectively. For more discussion see [Hultgren].

Enthalpies of mixing of liquid alloys obtained by [95 Lim], optimizing the set of thermodynamic data present in the literature, are shown in Fig. 3. As pointed out by these authors ([95 Lim]) the scatter of experimentally determined ΔH^L -values published by Kawakami [30 Kaw] and by Itagaki et al. [69 Ita] is rather high. Thus, the enthalpies of mixing shown in Fig. 3 are the more realistic ones.

Thermodynamic activities a_{Al}^S for solid alloys, as calculated in the frame of optimization thermodynamic data of this system, are given in Fig. 4. The results are in agreement with experimental data (better at Ag-rich, not so good at high Al-concentrations), as a comparison with data published by Hillert et al. [56 Hil] and by Massart et al. [70 Mas] shows.

In Fig. 5 calculated enthalpies of formation of solid alloys ([95 Lim]) are compared with experimentally determined ΔH^S -values (see Wittig et al. [59 Wit] and Baier et al. [81 Bai]).

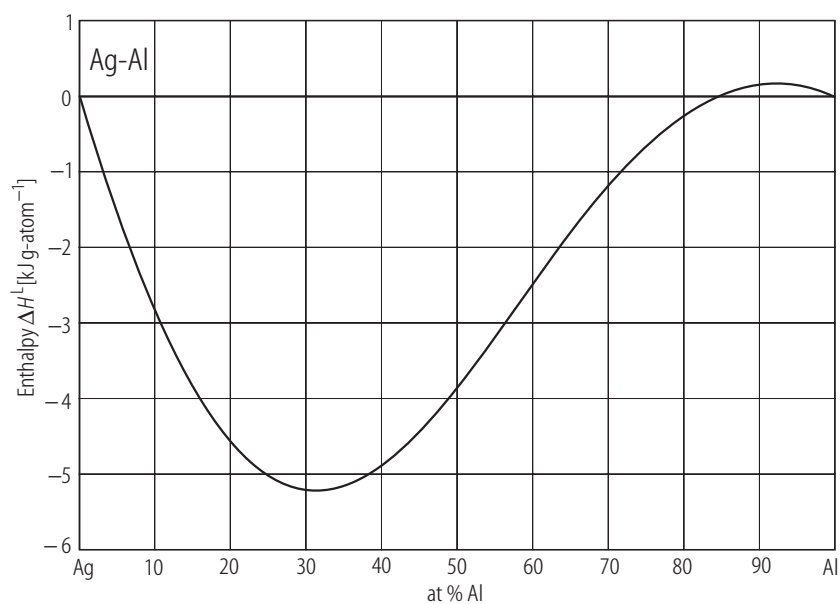


Fig. 3. Ag-Al. Enthalpies of mixing of liquid alloys [95 Lim].

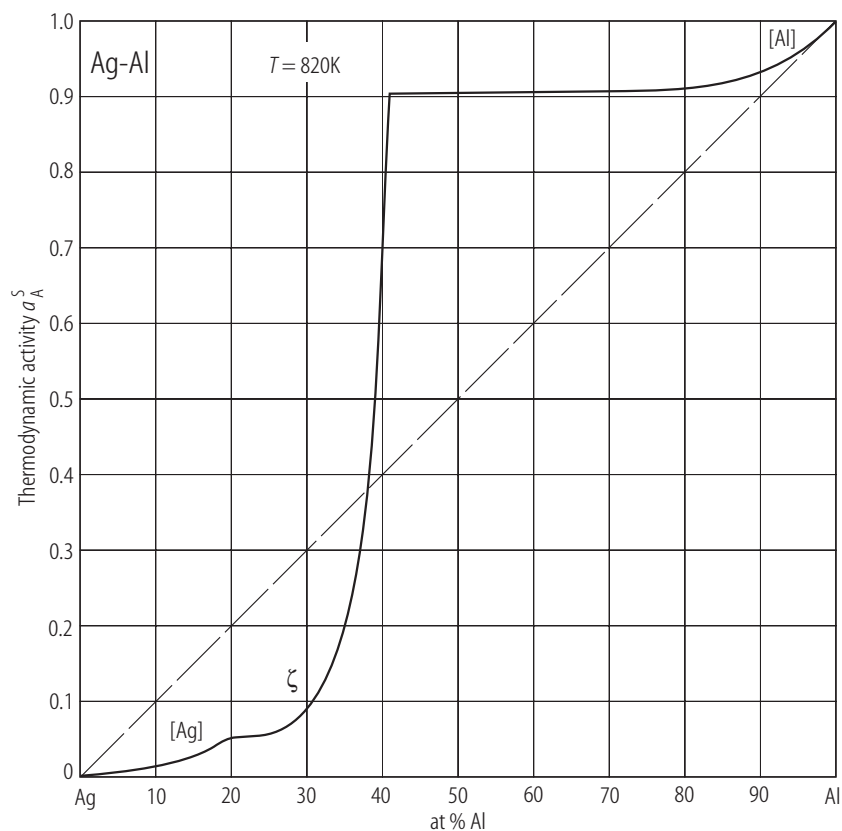


Fig. 4. Ag-Al. Thermodynamic activities of solid alloys [95 Lim].

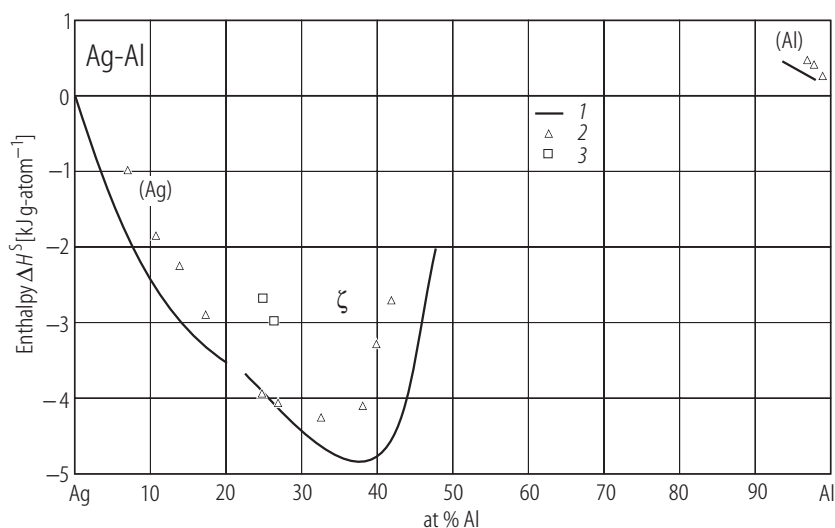


Fig. 5. Ag-Al. Enthalpies of formation of solid alloys [95 Lim].

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