

Al – Zr (Aluminum – Zirconium)

Phase diagram

Murray et al. [92 Mur] have reviewed this system. The assessed phase diagram is similar to the phase diagram in [Landolt-Börnstein].

A short discussion of this system is given by [93 Oka]. Especially he clarified the peritectic type of melting of AlZr_3 and AlZr_2 . The temperatures of these reactions are now 1292 K (AlZr_3) and 1488 K (AlZr_2).

Using the assessed thermodynamic data mentioned below, Wang et al. [01 Wan] have calculated phase equilibria shown in Fig. 1. Fig. 2 gives the results at high and Fig. 3 at low Zr concentrations, respectively.

The authors have pointed out, that the calculated data agree well with experimentally results obtained in the literature.

Thermodynamics

By [01 Wan] calculated enthalpies of mixing of liquid alloys are given in Fig. 4.

Enthalpies of formation of intermediate phases have been collected in Table 1.

Table 1. Al-Zr. Enthalpies of formation of intermediate phases in kJ g-atom⁻¹ [92 Mur].

AlZr_3	AlZr_2	Al_3Zr_5	Al_2Zr_3	Al_3Zr_4	Al_4Zr_5	AlZr	Al_3Zr_2	Al_2Zr	Al_3Zr	Reference
-	-	- 39	- 41	-	- 44	- 45	- 47	- 46	- 41	[84 Kem]
-	-	-	-	-	-	-	- 31	- 44	- 44	[76 Alc]
- 50	- 65	- 72	- 75	-	-	- 83	- 80	- 72	- 57	[88 deB]
- 36.2	- 48.4	- 51.5	- 55.2	- 58.5	- 55.4	- 65.0	- 56.6	- 52.6	- 48.5	[01 Wan]

Assessed enthalpies of mixing of liquid alloys are plotted in Fig. 2.

Metastable alloys

Ahn et al. [92 Ahn] have investigated the formation of an amorphous phase in AlZr_2 by hydrogen absorption. Ma et al. [93 Ma] have studied the stability and thermodynamic properties of the supersaturated solid solution and amorphous phase formed by ball milling in the Al-Zr system.

Figures

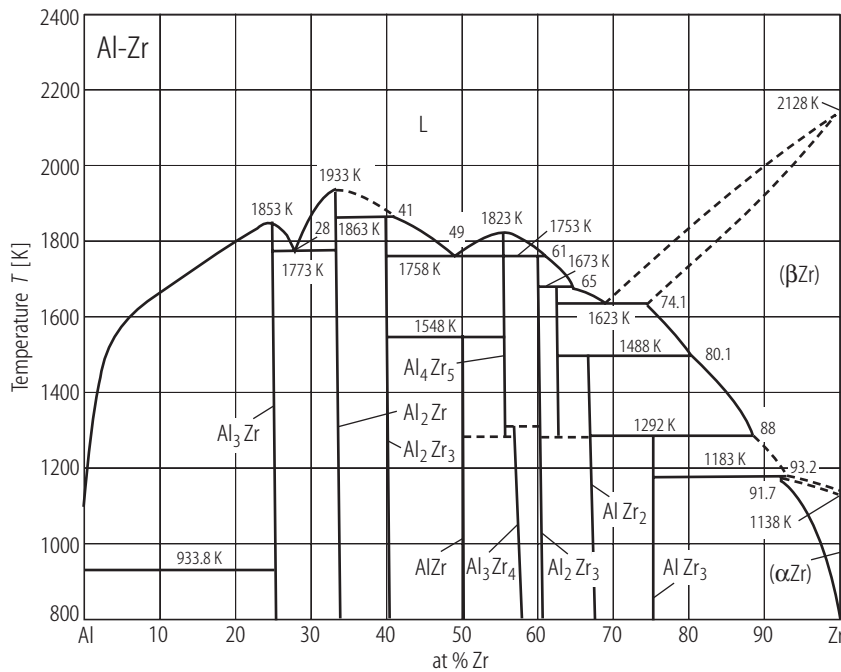


Fig. 1. Al-Zr. Calculated phase diagram [01 Wan].

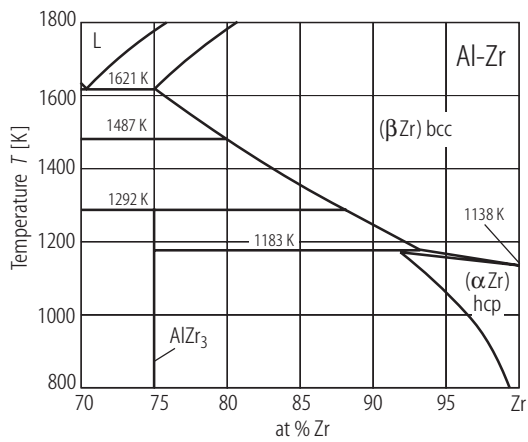


Fig. 2. Al-Zr. Calculated phase equilibria at high Zr-concentrations [01 Wan].

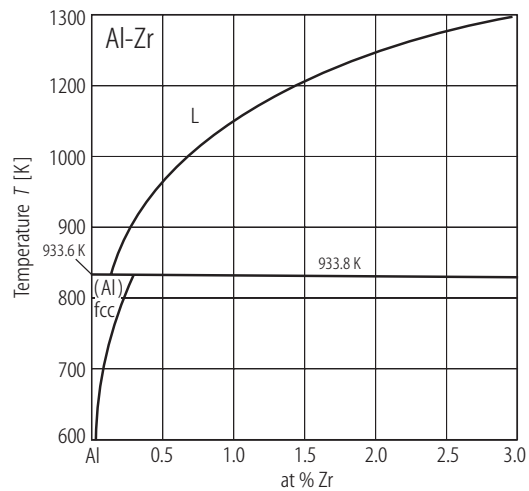


Fig. 3. Al-Zr. Calculated phase equilibria at low Zr-concentrations [01 Wan].

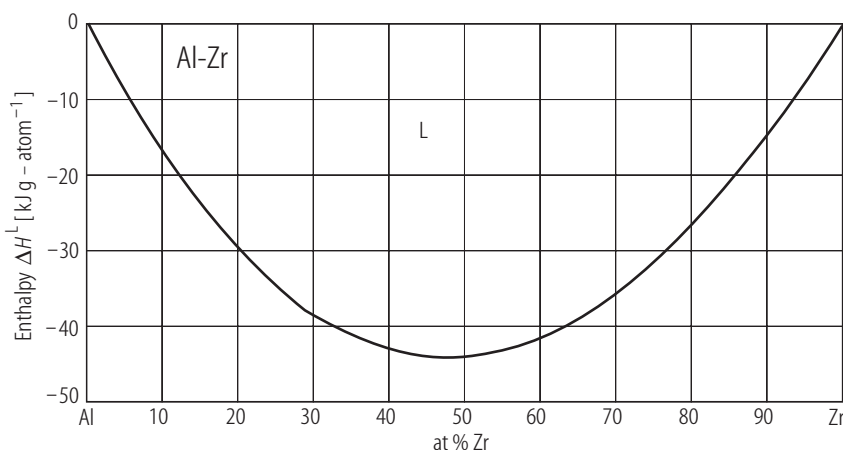


Fig. 4. Al-Zr. Enthalpies of mixing of liquid Al-Zr alloys calculated by [01 Wan].

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