

Al – H (Aluminum – Hydrogen)

Phase diagram

On the basis of relevant data present in the literature San-Martin et al. [92 San], after short discussion, have proposed a part of the phase diagram as shown in Fig. 1.

Crystal structure

Crystallographic data of phases are given in Table 1.

Table 1. Al–H. Crystallographic data of phases.

Phase	Composition [at% H]	Structure	Lattice parameters [nm]		Reference
			<i>a</i>	<i>c</i>	
(Al)	0.00012	cub	0.40496	-	[49 Str]
AlH ₃	75	hex	0.4449	1.1804	[69 Tur]
			0.4455	1.183	[80 Her]

Thermodynamics

The enthalpy of formation of AlH₃ has been determined by [67 Sin]. Its value is:

$$\Delta H^S = -11.42 \pm 0.84 \text{ kJ mol}^{-1}.$$

The stability at high pressure (up to 35 GPa) has been investigated by Baranowski et al. [85 Bar]. It could be shown that the hexagonal structure of AlH₃ does not undergo a transformation at pressures up to 35 GPa.

The hexagonal phase AlH₃ as [83 Bar] stated, is an equilibrium phase in the GPa range of hydrogen pressure. The amount of H solved in Al is sensitively dependent on impurities.

The melting point depression of Al caused by hydrogen absorption has been found by [81 Sha] to be approximately 2 K.

Raising the temperature, AlH₃ decomposes. As an example [92 San] has published a decomposition isotherm (pressure/concentration plot) of AlH₃ performed at 413 K by [83 Bar], [84 Bar] (see Fig. 2).

Figures

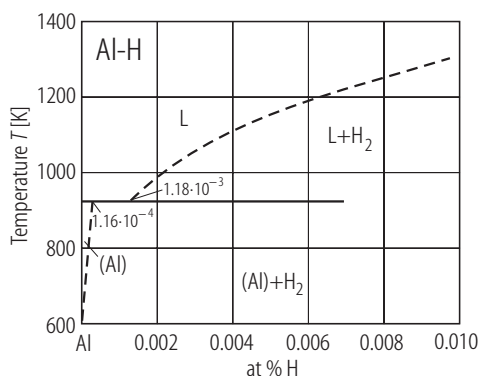


Fig. 1. Al–H. Assessed Al-H phase diagram at 0.1 MPa. Dashed lines are limits of the hydrogen-solubility. They are not necessarily phase boundaries [92 San].

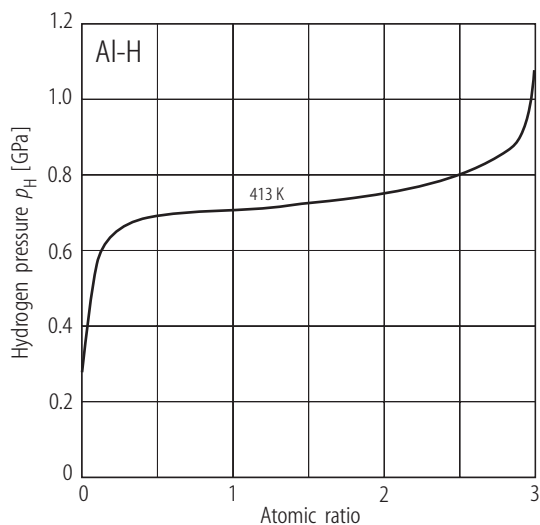


Fig. 2. Al-H. Decomposition of Al-H isotherm [84 Bar].

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