

Al – Ca (Aluminum – Calcium)

Phase diagram

By thermodynamic assessment Anglezio et al. [94 Ang] have obtained an optimized phase diagram, which is shown in Fig. 1. The calculated phase equilibria are in good agreement with data found experimentally by Matsuyama [28 Mat].

Thermodynamics

In Tables 1 and 2 thermodynamic data of Al_4Ca and Al_2Ca , respectively, are compiled by [94 Ang].

Table 1. Al–Ca. Thermodynamic values for the formation of Al_4Ca taken from [94 Ang]; $4 \text{ Al (fcc)} + \text{Ca (fcc)} \rightarrow \text{Al}_4\text{Ca}$.

Reference	Method	Temperature [K]	ΔH^S [kJ g-atom ⁻¹]	ΔS^S [J g-atom ⁻¹ K ⁻¹]
[59 Koc]	combustion	298	-209.0 ± 30	
[59 Koc]	dissolution	298	-219.5 ± 20	
[77 Pre]	EMF	823		
[81 Vel]	H ₂ titration		-100.9 ± 1.9	-21.45 ± 3.90
[82 Not1]	calorimetry	953	-93.5 ± 1.25	
[82 Not2]	EMF	800	-97.0 ± 16.5	-5.5 ± 2.5
[88 Itk]	optimization		-93.5	-22.95
[94 Ang]	optimization	800	-100.5	-23.85

Table 2. Al–Ca. Thermodynamic data of formation of Al_2Ca , taken from [94 Ang].

Reference	Method	Temperature [K]	ΔH^S [kJ g-atom ⁻¹]	ΔS^S [J g-atom ⁻¹ K ⁻¹]
[59 Koc]	combustion	298	-213.0 ± 18	
[59 Koc]	dissolution	298	-219.6 ± 12	
[77 Pre]	EMF	823	-93.8 ± 13	-17.0 ± 2.8
[82 Not1]	calorimetry	1038	-100.2 ± 21	
[82 Not2]	EMF	800	-102.9 ± 10.5	-18.3 ± 3.3
[88 Itk]	optimization		-95.3	-26.9
[94 Ang]	optimization	800	-100.8	-26.8

Within the frame of the above mentioned optimization of energetic values of the system [94 Ang] have calculated thermodynamic activities at 1623 K (see Fig. 2). The authors stated, that there is satisfactory agreement of the results found with the calculated activities, see [75 Sch], [88 Itk].

Amorphous alloys

Inoue et al. [94 Ino] have found at concentrations between 9 and 11 at% Ca amorphous alloys by melt spinning. The compositional dependence of metastable phases are given in Fig. 3. For orientation the equilibrium phase diagram is also shown there.

Figures

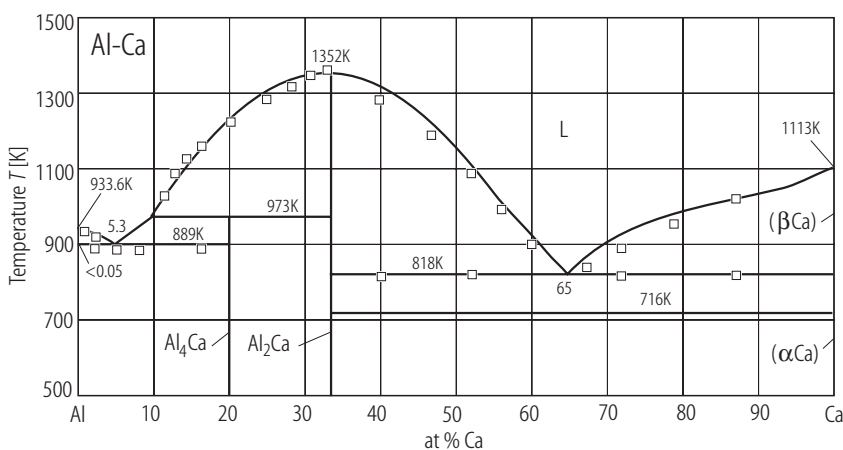


Fig. 1. Al-Ca. Optimized phase diagram [94 Ang].

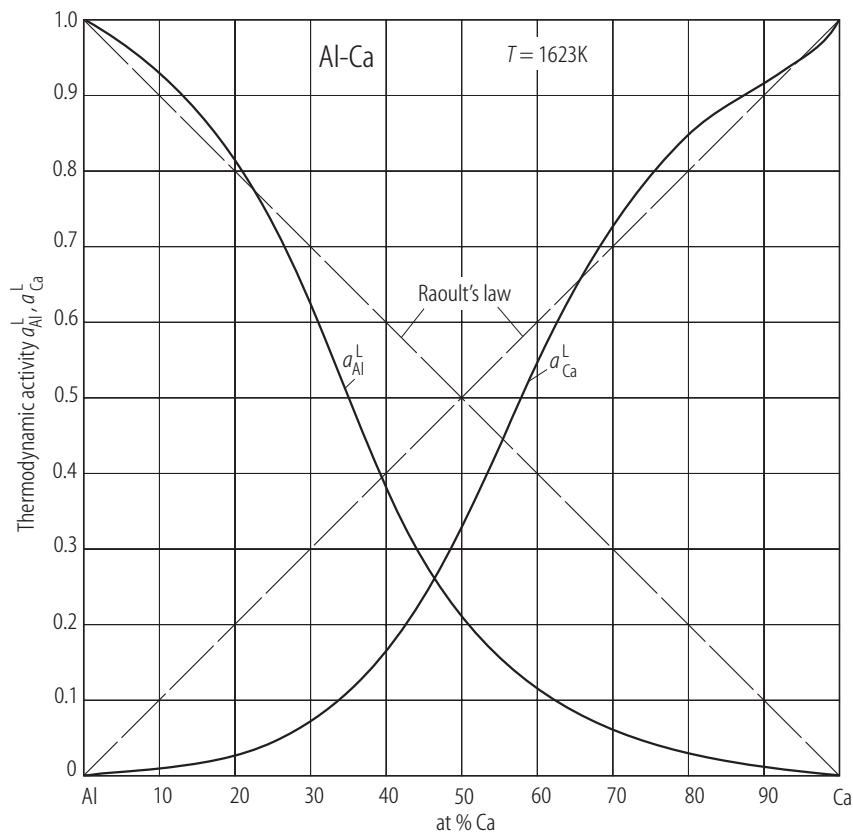


Fig. 2. Al-Ca. Optimized thermodynamic activities of liquid alloys [94 Ang].

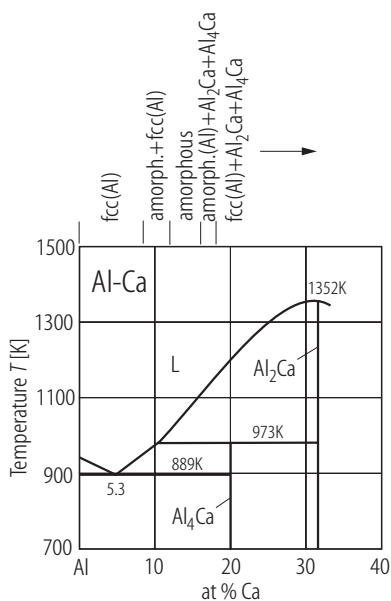


Fig. 3. Al-Ca. Amorphous alloys found by melt spinning in comparison to solid alloys [94 Ino].

References

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