

Al-Gd-V (Aluminum-Gadolinium-Vanadium)

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Recently, [2011Zha] determined an isothermal section for this ternary system at 500 °C.

Binary Systems

The Al-Gd system [2003Cac, Massalski2] has the following intermediate phases: Al₃Gd (*D*0₁₉, Ni₃Sn-type hexagonal), Al₂Gd (*C*15, MgCu₂-type cubic), AlGd (ErAl-type orthorhombic), Al₂Gd₃ (Al₂Zr₃-type tetragonal), and AlGd₂ (*C*23, Co₂Si-type orthorhombic). The Al-V phase diagram [2004Gon, Massalski2] depicts five intermetallic compounds: Al₈V₅ (*D*8₂, Cu₅Zn₈-type cubic), Al₃V (*D*0₂₂, TiAl₃-type tetragonal), Al₂₃V₄ (hexagonal), Al₄₅V₇ (monoclinic), and Al₂₁V₂ (cubic). There are no intermediate phases in the Gd-V system [Massalski2].

Ternary Isothermal Section

With starting metals of 99.99% Al, 99.9% Gd and 99.9% V, [2011Zha] arc-melted a number of alloys, which

were homogenized and given a final anneal at 500 °C for 240 h and quenched in liquid nitrogen. The phase equilibria were studied with x-ray powder diffraction and scanning electron microscopy with energy dispersive analysis. Two ternary compounds Al₄₃V₄Gd₆ (Al₄₃Mo₄Ho₆-type hexagonal with lattice parameters of $a = 1.0996$ nm and $c = 1.7813$ nm; denoted τ_1 here) and Al₂₀V₂Gd (Al₂₀Cr₂Ce-type cubic with $a = 1.456$ nm; denoted τ_2) were found. The isothermal section constructed by [2011Zha] at 500 °C is shown in Fig. 1. The binary compounds Al₂Gd₃, AlGd and Al₂Gd show a solubility of 1-2 at.% V. The other binary compounds do not show any ternary solubility.

References

2003Cac: G. Cacciamani, S. De Negri, A. Saccone, and R. Ferro, The Al-R-Mg (R = Gd, Dy, Ho) Systems. Part II: Thermodynamic Modeling of the Binary and Ternary Systems, *Intermetallics*, 2003, 11(11-12), p 1135-1151

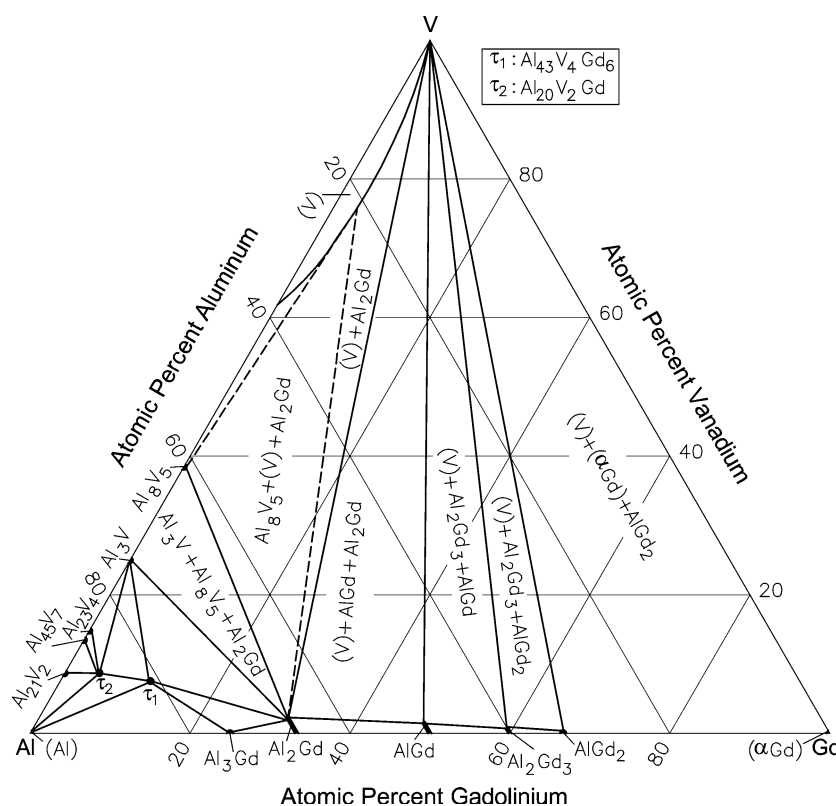


Fig. 1 Al-Gd-V isothermal section at 500 °C [2011Zha]. Narrow two-phase regions are omitted

2004Gon: W. Gong, Y. Du, B. Huang, R. Schmid-Fetzer, C. Zhang, and H. Xu, Thermodynamic Reassessment of the Al-V System, *Z. Metallkd.*, 2004, **95**(11), p 978-986

2011Zha: Y. Zhan, Z. Yang, H. Mo, and Y. Du, Phase Equilibria of the Al-V-RE (RE = Gd, Ho) Systems at 773 K (500 °C), *Metall. Mater. Trans. A*, 2012, **43**(1), p 29-36