Al-Er-V (Aluminum-Erbium-Vanadium)

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Recently, an isothermal section at 500 °C was reported for this ternary system by [2010Yan]. It depicts the previously-known ternary compound $\text{Al}_{43}\text{Er}_6\text{V}_4$.

Binary Systems

The Al-Er phase diagram [Massalski2] depicts the following intermediate phases: Al_3Er ($L1_2$, AuCu_3 -type cubic), Al_2Er ($C15$, MgCu_2 -type cubic), AlEr (AlEr -type

orthorhombic), Al_2Er_3 (Zr_3Al_2 -type tetragonal), and AlEr_2 ($C23$, Co_2Si -type orthorhombic). The Al-V phase diagram [2004Gon, 2010Yan, Massalski2] depicts five intermetallic compounds: Al_8V_5 ($D8_2$, Cu_5Zn_8 -type cubic), Al_3V ($D0_{22}$, TiAl_3 -type tetragonal), Al_{23}V_4 (hexagonal), Al_{45}V_7 (monoclinic), and Al_{10}V (cubic). There are no intermediate phases in the Er-V system. Here, a liquid miscibility gap is present with a monotectic reaction at 1870 °C.

Ternary Isothermal Section

With starting metals of 99.99% Al, 99.99% Er and 99.9% V, [2010Yan] arc-melted under Ar atm 58 binary and ternary alloys. The alloys were given a final anneal at 500 °C for 240 h and quenched in liquid nitrogen. The phase equilibria were studied with optical and scanning electron microscopy and x-ray powder diffraction. The isothermal section constructed at 500 °C by [2010Yan] is shown in Fig. 1. The ternary compound $\text{Al}_{43}\text{Er}_6\text{V}_4$ (denoted τ ; $\text{Al}_{43}\text{Ho}_6\text{Mo}_4$ -type hexagonal, Pearson symbol $hP106$, space group $P6_3/mcm$, lattice parameters $a = 1.08967$ nm and $c = 1.76236$ nm) is present. The Al-Er compounds Al_2Er , AlEr and Al_2Er_3 dissolve up to about 1-2 at.% V. The solubility of the third component in the other binary compounds is negligible.

References

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- 2010Yan:** Z. Yan, Y. Zhan, H. Mo, Y. Du, and H. Xu, Determination of the Phase Equilibria in the Al-Er-V Ternary System at 773 K, *J. Alloys Compd.*, 2010, **503**, p 61-64

Fig. 1 Al-Er-V isothermal section at 500 °C [2010Yan]. Narrow two-phase regions are omitted