Al-Nd-Zr (Aluminum-Neodymium-Zirconium)

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Recently, [2011Li] determined an isothermal section at 500 °C for this ternary system, which depicts no ternary compounds.

Binary Systems

The Al-Nd phase diagram [2005Gao] shows the following compounds: AlNd_3 ($D0_{19}$, Ni_3Sn -type hexagonal), AlNd_2 ($C23$, Co_2Si -type orthorhombic), AlNd (ErAl -type orthorhombic), Al_2Nd ($C15$, MgCu_2 -type cubic), $\alpha\text{Al}_3\text{Nd}$ (Ni_3Sn -type hexagonal), $\beta\text{Al}_3\text{Nd}$ (stable between 1205 and 888 °C), Al_4Nd or $\beta\text{Al}_{11}\text{Nd}_3$ ($D1_3$, Al_4Ba -type tetragonal), and $\alpha\text{Al}_{11}\text{Nd}_3$ ($\alpha\text{Al}_{11}\text{La}_3$ -type orthorhombic). The Al-Zr phase diagram [Massalski2] depicts the following intermediate phases: Al_3Zr ($D0_{23}$ -type tetragonal), Al_2Zr ($C14$, MgZn_2 -type hexagonal), Al_3Zr_2 (Al_3Zr_2 -type orthorhombic), AlZr (B_7 , CrB -type orthorhombic), Al_4Zr_5 (Ga_4Ti_5 -type hexagonal), Al_3Zr_4 (Al_3Ir_4 -type hexagonal), Al_2Zr_3 (Al_2Zr_3 -type tetragonal), Al_3Zr_5 ($D8_m$, W_5Si_3 -type tetragonal), AlZr_2 ($B8_2$, Ni_2In -type hexagonal), and AlZr_3 ($L1_2$, AuCu_3 -type cubic). There are no intermediate phases in the Nd-Zr system [2011Li].

Ternary Isothermal Section

With starting metals of 99.9% Al, 99.99% Nd and 99.9% Zr, [2011Li] arc-melted under Ar atm a number of binary and ternary alloys. After homogenization, the alloys were given a final anneal at 500 °C for 160 h and quenched in liquid nitrogen. The phase equilibria were studied by x-ray powder diffraction and scanning electron microscope equipped with energy dispersive x-ray analyzer. The isothermal section constructed by [2011Li] at 500 °C is shown in Fig. 1. No ternary phase is present. No significant solubility of the third component in the binary compounds

Fig. 1 Al-Nd-Zr isothermal section at 500 °C [2011Li]. Narrow two-phase regions are omitted

was found. The binary compounds Al_3Zr_5 , Al_4Zr_5 and $\beta\text{Al}_{11}\text{Nd}_3$ are not stable at 500 °C.

References

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