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Al-Dy-Ti (Aluminum-Dysprosium-Titanium)

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Recently, [2002Zho] and [1996Zha] determined isothermal sections of this system at 500 and 1000 °C, respectively.

Binary Systems

The Al-Dy phase diagram [2000Sac] has five intermediate phases of fixed stoichiometry: $DyAl_3$ ($HoAl_3$-type rhombohedral), $DyAl_2$ (*C*15 type cubic), DyAl (ErAl-type orthorhombic), Dy_3Al_2 (Zr_3Al_2-type tetragonal), and Dy_2Al (Co_2Si-type orthorhombic). An update of the Al-Ti system appears in this issue. There are no intermediate phases in the Dy-Ti system [Massalski2]. The mutual solid solubility between Ti and Dy is small.

Ternary Compounds

Two Al-rich ternary compounds were reported in this system by [1995Nie1,2]. $Dy_6Ti_4Al_{43}$ (denoted τ_1 here) is $Ho_6Mo_4Al_{43}$-type hexagonal, space group $P6_3/mcm$, a = 1.1046 nm, and c = 1.7877 nm [1995Nie1]. The second compound $DyTi_2Al_{20}$ (τ_2) is $CeCr_2Al_{20}$-type cubic, space group $Fd3$ or $Fd3m$, a = 1.4672 nm [1995Nie2].

Ternary Isothermal Section

With starting metals of purity > 99.9%, [2002Zho] melted 140 alloy samples in an arc furnace under Ar atmosphere. After the final anneal at 500 °C for 170 h, the samples were quenched in an ice-water mixture. The phase equilibria were studied by electron microscopy and x-ray powder diffraction. The isothermal section at 500 °C constructed by [2002Zho] is redrawn in Fig. 1 to agree with the accepted binary data. The two ternary compounds $Dy_6Ti_4Al_{43}$ (τ_1) and $DyTi_2Al_{20}$ (τ_2) are present at 500 °C. Dy_2Al, Dy_3Al_2 and $DyAl_2$ dissolve 2.1, 3.6, and 16.5 at.% Ti, respectively. The solubility of Dy in Al-Ti phases is less than 1 at.%. Reference [1996Zha], wherein a partial isothermal section at 1000 °C is reported, is not available to this reviewer.

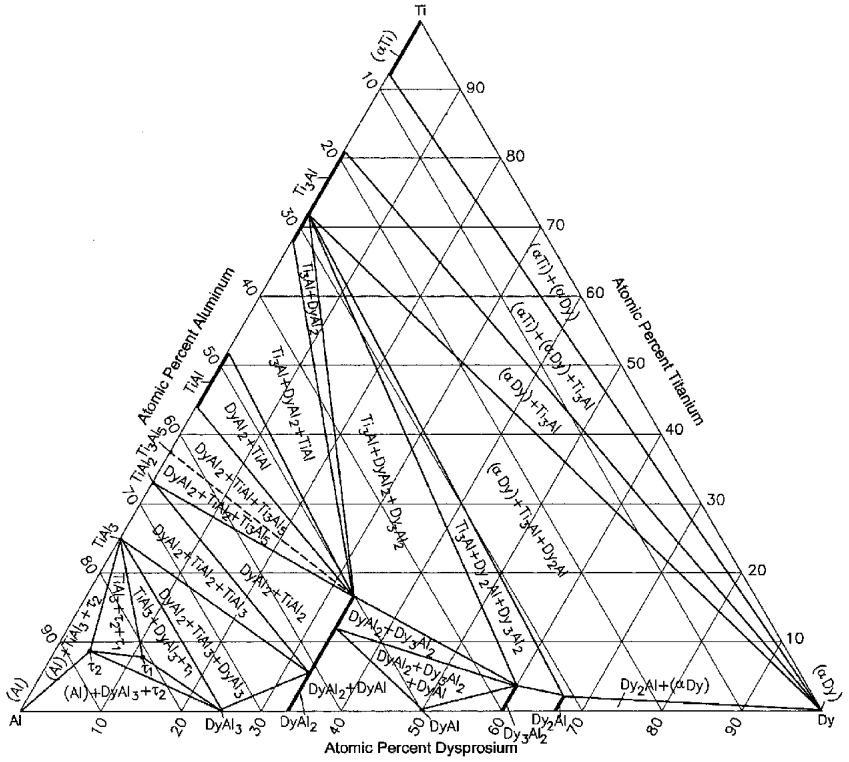

Fig. 1 Al-Dy-Ti isothermal section at 500 °C [2002Zho]; Narrow two-phase regions around tie-triangles are omitted.

References

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