JPEDAV (2007) 28:440–441
DOI: 10.1007/s11669-007-9131-9
1547-7037 ©ASM International

Al-B-Dy (Aluminum-Boron-Dysprosium)

V. Raghavan

Recently, [2002Cha] determined a composite isothermal section for this system at 600 °C for compositions above 50 at.% Al and at 800 °C for Al < 50 at.%.

Binary Systems

There are two intermediate phases in the Al-B system: AlB_2 ($C32$, AlB_2-type hexagonal) and AlB_{12} (AlB_{12}-type tetragonal). The Al-Dy phase diagram [Massalski2, 2002Cha] depicts the following intermediate phases: $\alpha DyAl_3$ ($D0_{24}$, Ni_3Ti-type hexagonal), $\beta DyAl_3$ ($HoAl_3$-type rhombohedral), $DyAl_2$ ($C15$, $MgCu_2$-type cubic), DyAl (ErAl-type orthorhombic), Dy_3Al_2 (Zr_3Al_2-type tetragonal), and Dy_2Al ($C23$, Co_2Si-type orthorhombic). The B-Dy diagram [Massalski2, 2002Cha] has the following intermediate phases: DyB_2 (AlB_2-type hexagonal), DyB_4 ($D1_e$, ThB_4-type tetragonal), DyB_6 ($D2_1$, CaB_6-type cubic), DyB_{12} ($D2_f$, UB_{12}-type cubic), and DyB_{66} (cubic).

Ternary Phases

Two ternary compounds are known in this system: $DyAl_3B_x$ (x = 0.4−0.5) ($BaPb_3$-type rhombohedral, space group $R\bar{3}m$, a = 0.6156 nm and c = 2.109 nm [1980Mik], denoted τ_1 here) and $DyAlB_{14}$ ($MgAlB_{14}$-type orthorhombic, space group *Imma*, a = 0.5819 nm, b = 1.0380 nm, and c = 0.8176 nm [1988Kuz], denoted τ_2 here).

Ternary Isothermal Section

With starting metals of 99.99% Al, 99.40% B, and 99.87% Dy, [2002Cha] arc-melted 36 alloy compositions and annealed them for ≥720 h, at 800 °C for Al < 50 at.% and at 600 °C for Al > 50 at.%. The phase equilibria were studied with x-ray powder diffraction. The composite isothermal section at 800 °C for Al < 50 at.% and at 600 °C for Al > 50 at.% constructed by [2002Cha] is shown in Fig. 1. [2002Cha] found that the ternary compound

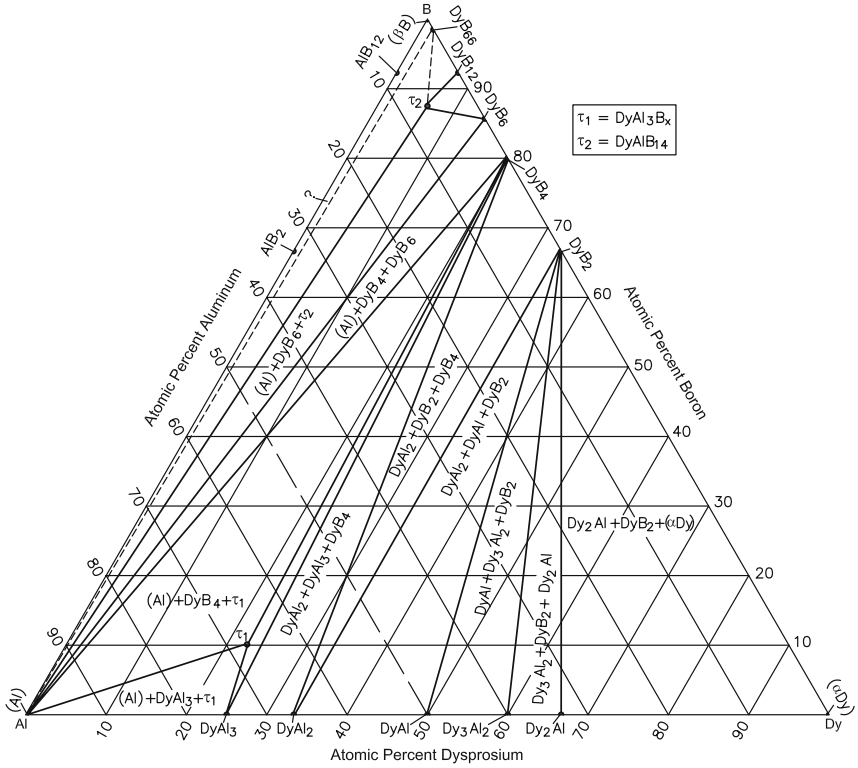

Fig. 1 Al-B-Dy isothermal section at 600 °C for Al > 50 at.% and at 800 °C for Al < 50 at.% [2002Cha]. Thin two-phase regions are omitted

$DyAlB_{14}$ (τ_2) is slightly B-rich than indicated by the nominal formula. The composition region near $DyAl_{66}$ was not investigated by [2002Cha].

References

1980Mik: S.I. Mikhalenko, S.V. Orishchin, and Yu.B. Kuzma, Crystal Structures of $HoAl_3B_x$ and $DyAl_3B_x$, *Metally*, 1980, (2), p 212-214, in Russian

1988Kuz: Yu.B. Kuzma, V.M. Gurin, M.M. Korsukova, N.F. Chaban, and S.I. Chikhrii, New Aluminoborides of Rare-Earth Metals with Structures of $MgAlB_{14}$ Type, *Neorg. Mater.*, 1988, **24**(12), p 1986-1989, in Russian; TR: *Inorg. Mater.*, 1988, **24**(12), p 1705-1708

2002Cha: N.F. Chaban, S.I. Mikhalenko, M.M. Seredich, and Yu.B. Kuzma, Equilibrium Phase Diagrams for the Dy-Al-B and Er-Al-B Systems, *Poroshk. Metall.*, 2002, (7-8), p 82-87, in Russian; TR: *Powder Metall. Met. Ceramics*, 2002, **41**(7-8), p 407-412