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Al-Ho-Ti (Aluminum-Holmium-Titanium)

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Recently, [2000Hua] determined an isothermal section for this system at 500 °C.

Binary Systems

The Al-Ho phase diagram [1988Gsc] depicts five intermetallic compounds: $HoAl_3$ (rhombohedral), $HoAl_2$ ($MgCu_2$-type cubic), HoAl (ErAl-type orthorhombic), Ho_3Al_2 (Zr_3Al_2-type tetragonal), and Ho_2Al (Co_2Si-type orthorhombic). An additional phase Ho_2Al_{17} (Th_2Zn_{17}-type rhombohedral) was reported by [1993And] and confirmed by [2000Hua]. An updated version of the Al-Ti system appears in this issue. The Ho-Ti phase diagram is not known.

Ternary Compounds

Two Al-rich ternary compounds were reported in this system by [1995Nie1,2]. $Ho_6Ti_4Al_{43}$ (denoted τ_1 here) is $Ho_6Mo_4Al_{43}$-type hexagonal, space group $P6_3/mcm$, a = 1.1035 nm, and c = 1.7839 nm [1995Nie1]. The second compound $HoTi_2Al_{20}$ (τ_2) is $CeCr_2Al_{20}$-type cubic, space group $Fd3$ or $Fd3m$, a = 1.4670 nm [1995Nie2].

Isothermal Section

With starting metals of 99.9% purity, [2000Hua] melted 124 alloy bottons in an arc furnace under Ar atm. The samples were given a final anneal at 500 °C for 4 days and quenched in ice-water mixture. The phase equilibria were studied mainly by x-ray powder diffraction, with supplementary data from differential thermal analysis and electron probe microanalysis. The isothermal section at 500 °C constructed by [2000Hua] is redrawn in Fig. 1 to agree with the accepted binary data. The two ternary compounds τ_1 and τ_2 are present at 500 °C. The maximum solubility of Ti in Ho_2Al, Ho_3Al_2 and $HoAl_2$ are 2, 3, and 15 at.%, respectively. The solubility of Ho in the Ti-Al phases is ≤0.6 at.%. [2000Hua] assumed that no intermediate phases exist in the Ho-Ti system.

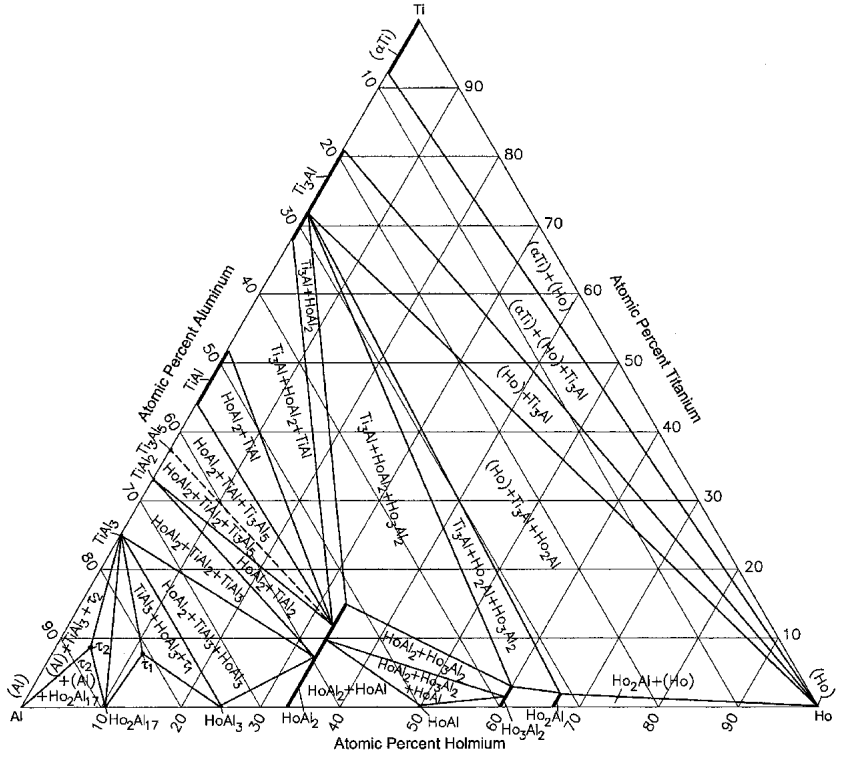

Fig. 1 Al-Ho-Ti isothermal section at 500 °C [2000Hua]; narrow two-phase regions around tie-triangles are omitted.

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