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Al-Mo-Sc (Aluminum-Molybdenum-Scandium)

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An isothermal section at 550 °C and a vertical section in the Al-rich region were reported by [1990Che] for this ternary system. Since then, the Al-Mo binary phase diagram has undergone considerable changes in the Al-rich region [2006Eum] and only a tentative isothermal section at 550 °C is given here.

Binary Systems

The Al-Mo phase diagram [2006Eum] depicts the following intermediate phases: $MoAl_{12}$ ($Al_{12}W$-type cubic), $MoAl_5$ (r) (rhombohedral, space group $R\bar{3}c$), $MoAl_5$ (h′) (hexagonal, $P321$), $MoAl_5$ (h) (hexagonal, $P6_322$), Mo_5Al_{22} (orthorhombic, $Fdd2$), Mo_4Al_{17} (monoclinic, $C2$), $MoAl_4$ (monoclinic, Cm), $MoAl_3$ (monoclinic, $C2/m$), Mo_3Al_8 (monoclinic, Cm), $Al_{63}Mo_{37}$, MoAl (bcc), and Mo_3Al ($A15$, Cr_3Si-type cubic). The Al-Sc phase diagram [Massalski2] depicts the following intermediate compounds: $ScAl_3$ ($L1_2$, $AuCu_3$-type cubic), $ScAl_2$ ($C15$, $MgCu_2$-type cubic), ScAl ($B2$, CsCl-type cubic) and Sc_2Al ($B8_2$, Ni_2In-type hexagonal). There are no intermediate phases in the Mo-Sc system, which exhibits a eutectic solidification.

Ternary Isothermal Section

With starting metals of 99.999% Al, 99.97% Mo, and pure Sc, [1990Che] prepared alloys by electron beam melting under Ar atm. The alloys were annealed at 550 °C for 720 h and quenched. The phase equilibria were studied by x-ray powder diffraction, differential thermal analysis, and transmission electron microscopy. The isothermal section at 550 °C constructed by [1990Che] in the Al-rich region is redrawn tentatively in Fig. 1 to agree with the accepted binary data.

The vertical section constructed by [1990Che] is difficult to interpret due to the binary discrepancies and is not given here. The final solidification at the Al-end occurs through a ternary eutectic reaction: $L \leftrightarrow (Al) + ScAl_3 + MoAl_{12}$, just below 600 °C. [1990Che] also studied the formation of metastable phases by rapid quenching and their subsequent decomposition during ageing.

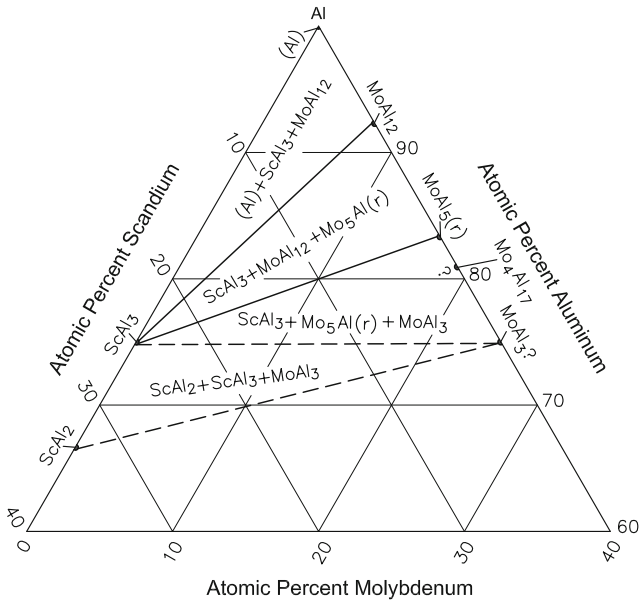

Fig. 1 Al-Mo-Sc tentative isothermal section at 550 °C for Al-rich alloys [1990Che]. Two-phase regions are omitted

References

1990Che: G.M. Chel'dieva, E.F. Kazakova, E.M. Sokolovskaya, and N.I. Kaloev, Formation and Decomposition of Metastable Phases in Aluminum Alloys, *Metally*, 1990, (6), p 88-91, in Russian; TR: *Russ. Metall.*, 1990, (6), p 87-90

2006Eum: M. Eumann, G. Sauthoff, and M. Palm, Re-evaluation of Phase Equilibria in the Al-Mo System, *Int. J. Mater. Res.*, 2006, **97**(11), p 1502-1511