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Al-Mo-Zn (Aluminum-Molybdenum-Zinc)

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Recently, [2006Wan] determined an isothermal section for this ternary system at 450 °C.

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), $Mo_{37}Al_{63}$, MoAl (bcc), and Mo_3Al ($A15$, Cr_3Si-type cubic). In the Al-Zn system [Massaslski2], solidification occurs through a eutectic reaction at 381 °C yielding (Zn) and (Al). On solidification, (Al) has more than 60 at.% of dissolved Zn. At lower temperatures, this solid solution exhibits a miscibility gap, with a monotectoid reaction at 277 °C: (Al)′ ↔ (Al) + (Zn). In the Mo-Zn system [Massalski2], to intermediate phases $MoZn_{22}$ (orthorhombic) and $MoZn_7$ (Ca_7Ge-type cubic) are stable below 463 and 575 °C respectively.

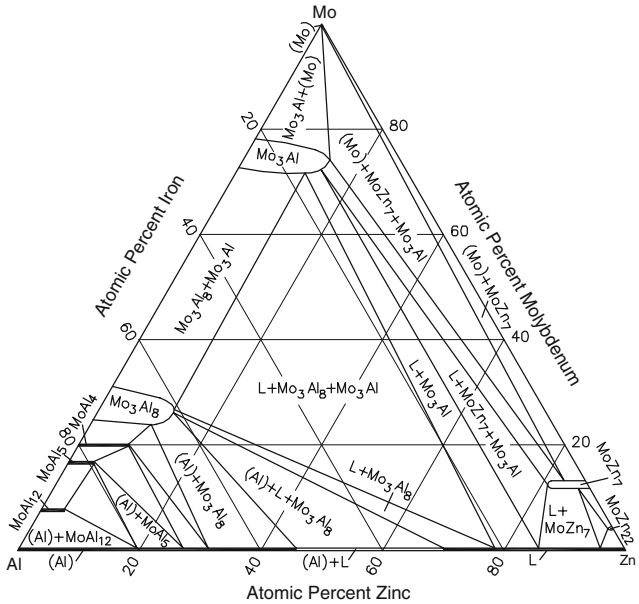

Fig. 1 Al-Mo-Zn isothermal section at 450 °C [2006Wan]

Ternary Isothermal Section

With starting metals of 99.99% purity, [2006Wan] melted 23 ternary alloys containing up to 40 at.% Mo in evacuated quartz tubes at 1200 °C. The alloys were given a final anneal at 460 °C for 20 d and quenched in water. The phase equilibria were studied with metallography, x-ray powder diffraction and energy dispersive x-ray analysis attached to the scanning electron microscope. The identified phases and their measured compositions were listed. The isothermal section at 460 °C constructed by [2006Wan] is shown in Fig. 1. The phase $MoAl_4$ shown by [2006Wan] is presumably Mo_4Al_{17} [2006Eum]. The equilibria involving Mo_5Al_{22} are not known. The phases MoAl and $Mo_{37}Al_{63}$ are not stable at this temperature. The solubility of Mo in liquid (Zn) and solid (Al) is negligible. Mo_3Al and Mo_3Al_8 dissolve up to 11.5 and 13.5 at.% Zn respectively. $MoZn_{22}$ and $MoZn_7$ dissolve up to 1 and 7 at.% Al respectively. No ternary phases were found.

References

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2006Wan: Z. Wang, J. Wang, N.Y. Tang, Y.H. Liu, and X. Su, The 450 °C Isothermal Section of the Zn-Al-Mo Phase Diagram, *J. Phase Equilib. Diffus.*, 2006, **27**(5), p 469-476