

Al-Cr-Mo-Ti (Aluminum-Chromium-Molybdenum-Titanium)

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The information on this system is limited to a schematic sketch of the phase relationships in the temperature range of 1200 to 950 °C by [2002Miu].

Binary Systems

For brief descriptions of the Al-Cr, Al-Ti, and Cr-Ti systems, see the Al-Cr-Ti update in this issue. For Al-Mo and Mo-Ti descriptions, see the Al-Mo-Ti update in this issue. The Cr-Mo phase diagram [Massalski2] depicts a continuous body-centered cubic (bcc) solid solution between Mo and Cr. A miscibility gap occurs in the solid state below 880 °C, when Cr-rich and Mo-rich bcc phases form.

Ternary Systems

Updates on the Al-Cr-Ti and Al-Mo-Ti systems appear in this issue. Computed isothermal sections of the Al-Cr-Mo system at 2227, 2027, 1227, and 727 °C were given by [1974Kau]. For the Cr-Mo-Ti system, [1953Eli] gave several isothermal and vertical sections for Ti-rich alloys in the temperature range of 550 to 1300 °C.

Quaternary Phase Equilibria

[2002Miu] arc-melted Ar atmosphere 10 quaternary alloys containing 48 to 52 at.% Al, 8 to 20 at.% Cr, 8 to 20 at.% Mo, and 20 to 24 at.% Ti. The alloys were annealed at 1200 to 950 °C for 18 to 48 h. The phase equilibria were studied by scanning electron microscopy, x-ray diffraction, and wavelength dispersive x-ray spectroscopy. Differential thermal analysis was used to determine arrests due to phase changes. In the composition and temperature ranges studied by the authors, the bcc phase had a composition range of $Al_{42-47}Cr_{9-20}Mo_{17-20}Ti_{21-25}$. The $TiAl_3$ (DO_{22}) phase had a range of $Al_{62-63}Cr_{2-3}Mo_{11-12}Ti_{21-24}$. The $L1_2$ phase found at lower temperatures has the composition $Al_{61}Cr_9Mo_4Ti_{26}$. The Ti content of the three phases is almost the same and is 25 at.%. An incomplete schematic sketch of the phase relationships is shown as a perspective view in Fig. 1 [2002Miu]. The limiting boundary of the bcc region moves toward the Cr corner with decreasing temperature. The three-phase region of (bcc + DO_{22} + $L1_2$) is limited in extent.

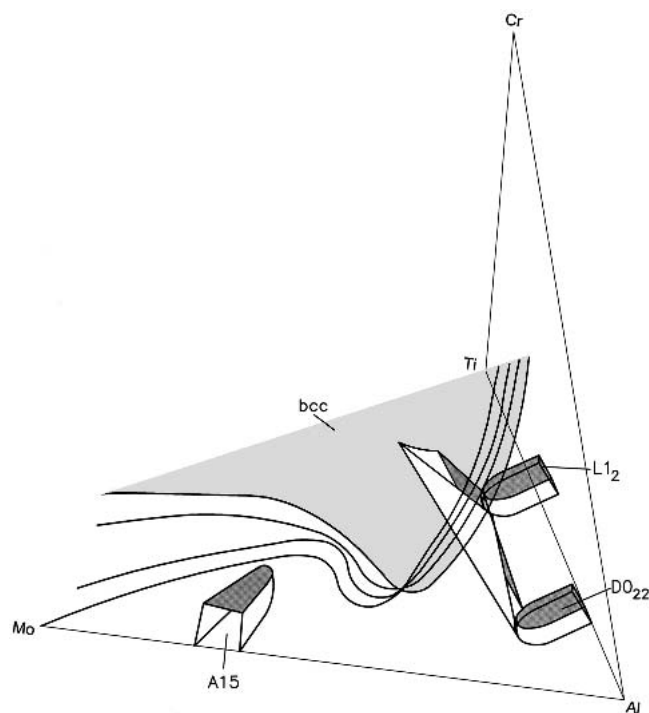


Fig. 1 Al-Cr-Mo-Ti schematic and incomplete perspective view of the phase relationships [2002Miu]

[2002Miu] speculated on the possible existence of a (bcc + $A15$ + DO_{22}) equilibrium and a tie-tetrahedron of (bcc + $A15$ + DO_{22} + $L1_2$).

References

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- 1974Kau:** L. Kaufman and H. Nesor, Calculation of Superalloy Phase Diagrams: Part II, *Metall. Trans.*, Vol 5, 1974, p 1623-1629
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