

Al-Ir-Ti (Aluminum-Iridium-Titanium)

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Recently, [2005Miu] determined a partial liquidus projection and an isothermal section at 1650 °C for Ir-rich alloys of this system.

Binary Systems

The Al-Ir phase diagram in the Ir-rich region determined by [2005Miu] depicts a eutectic reaction between (Ir) and IrAl (*B2*, CsCl-type cubic) at 30.5 at.% Al and ~2020 °C. The other Al-Ir phases are: Ir₂Al₅ (cubic, space group *Pm* $\bar{3}$ *n*), IrAl₃ (*D*₀₁₈, Na₃As-type hexagonal), Ir₄Al₁₃ (monoclinic), and Ir₂Al₉ (*D*_{8d}, Co₂Al₉-type monoclinic). The Ir-Ti phase diagram [Massalski2, 2005Miu] has the following intermediate phases: Ir₃Ti (*L*₁₂, AuCu₃-type cubic), β IrTi (*B2*, CsCl-type cubic), γ IrTi (*L*₁₀, AuCu-type tetragonal), and IrTi₃ (*A*₁₅, Cr₃Si-type cubic).

Ternary Phase Equilibria

With starting metals of 99.99% Al, 99.9% Ir, and 99.5% Ti, [2005Miu] arc-melted under Ar atm three

Ir-rich ternary alloys: 70Ir-24Al-6Ti, 70Ir-20Al-10Ti, and 76Ir-12Al-12Ti (at.%). The samples were annealed at 1650 °C for 24 h. The phase equilibria were studied with scanning electron metallography, wavelength dispersive x-ray spectroscopy, and differential thermal analysis. The partial liquidus projection constructed by [2005Miu] is shown in Fig. 1. In the Ir-rich region, a U-type transition reaction $L + \text{Ir}_3\text{Ti} \leftrightarrow (\text{Ir}) + \text{IrAl}$ occurs. Figure 2 shows the partial isothermal section at 1650 °C. In the solid solution based on Ir₃Ti, Al substitutes for Ti up to the solubility limit of 6 at.%. No ternary phases were found in this region. The previously known ternary compound Al₁₆Ir₈Ti₆ (*Mn*₂₃Th₆-type cubic) lies outside the investigated range.

Reference

2005Miu: S. Miura, K. Ohkubo, Y. Terada, Y. Kimura, Y. Mishima, Y. Yamabe-Mitarai, H. Harada, and T. Mohri, Phase Equilibria in the Ir-Rich Portion of the Ir-Al-X (X: Ti, Zr and Hf) Ternary Systems, *J. Alloys Compd.*, 2005, **393**, p 239-247

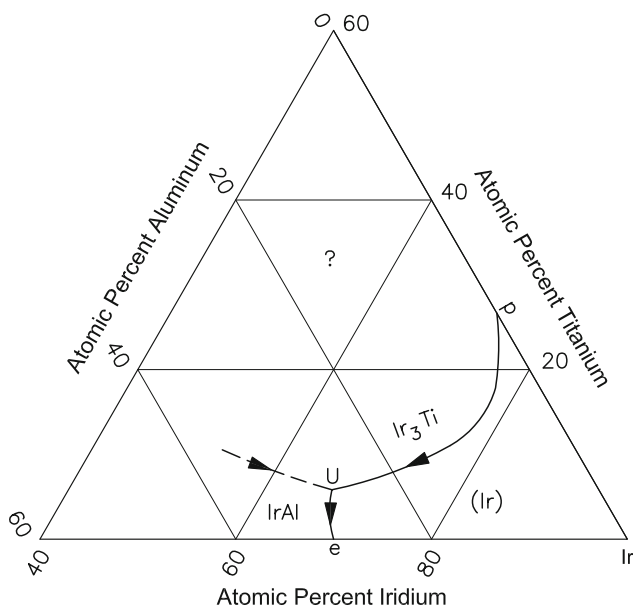


Fig. 1 Al-Ir-Ti partial liquidus projection for Ir-rich alloys [2005Miu]

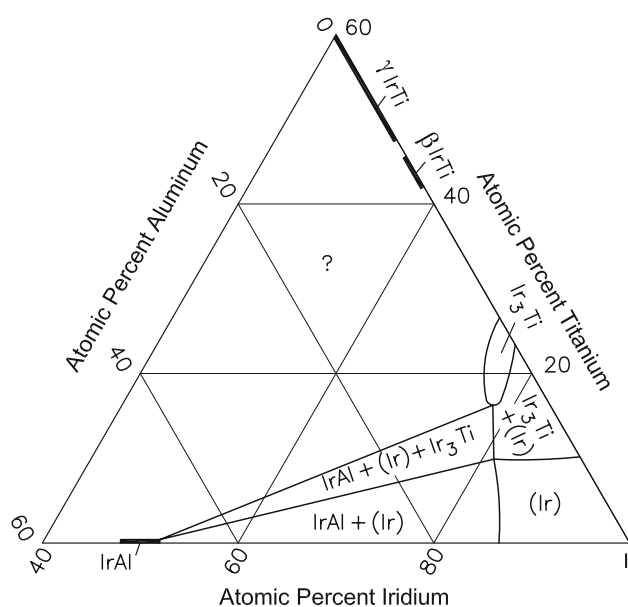


Fig. 2 Al-Ir-Ti partial isothermal section at 1650 °C for Ir-rich alloys [2005Miu]