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Al-Ir-Pt (Aluminum-Iridium-Platinum)

V. Raghavan

Recently, [2003Yam] reported partial isothermal sections at 1700 and 1500 °C for Ir-rich alloys of this system.

Binary Systems

The Al-Ir phase diagram [Massalski2] depicts the following intermediate phases: Ir_2Al_9 ($D8_d$, Co_2Al_9-type monoclinic), Ir_4Al_{13} (monoclinic), $IrAl_3$ ($D0_{18}$, Na_3As-type hexagonal), Ir_2Al_5 (or $IrAl_{2.7}$, cubic), and IrAl ($B2$, CsCl-type cubic). The Al-Pt phase diagram [1986Mca] depicts nine intermetallic compounds: Pt_5Al_{21} (cubic), Pt_8Al_{21} (tetragonal), $PtAl_2$ ($C1$, CaF_2-type cubic), Pt_2Al_3 (hexagonal), PtAl ($B20$, FeSi-type cubic), β (52 to 56 at.% Pt; $B2$, CsCl-type cubic), Pt_5Al_3 (Ge_3Rh_5-type orthorhombic), Pt_2Al ($PbCl_2$-type orthorhombic above 1060 °C and Pt_2Ga-type orthorhombic below 1060 °C), and Pt_3Al ($L1_2$, $AuCu_3$-type cubic and low-temperature Pt_3Ga-type tetragonal). In the Ir-Pt system, Ir and Pt form a continuous face-centered cubic (fcc) solid solution. A miscibility gap is present below ~925 °C.

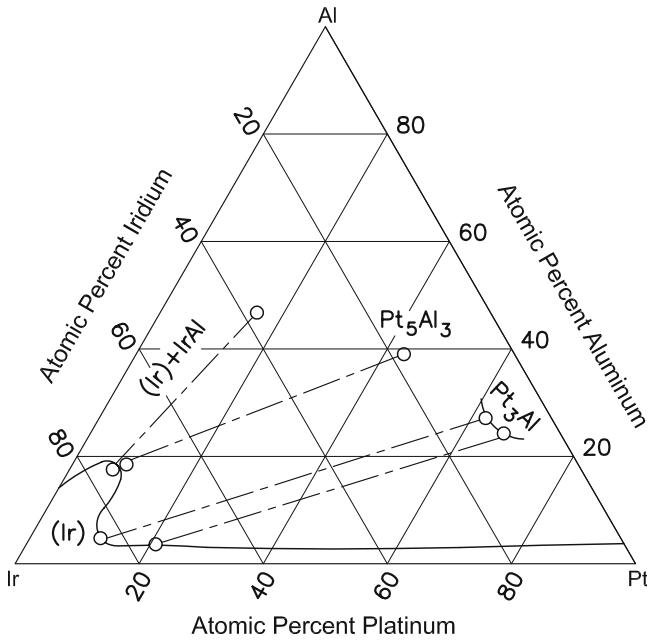

Fig. 1 Al-Ir-Pt partial isothermal section at 1700 °C [2003Yam]

Ternary Isothermal Sections

[2003Yam] arc-melted eight Ir-rich ternary alloys under Ar atm. The alloys were annealed at 1700 and 1500 for 72 h. The phase equilibria were studied by scanning electron microscopy, x-ray diffraction, and electron probe microanalyzer. Based mostly on measured tie-lines in two-phase equilibrium, [2003Yam] sketched incomplete isothermal sections for Ir-rich alloys at 1700 and 1500 °C, as shown in Fig. 1 and 2. The two-phase equilibria observed at 1700 °C (Fig. 1) are between the fcc phase at the Ir-end and IrAl, Pt_5Al_3, or Pt_3Al at the other end. At 1500 °C (Fig. 2), the fcc phase forms tie-lines with the same three phases as at 1700 °C. The co-existing compositions in the tie-triangle of (fcc + IrAl + PtAl) were measured.

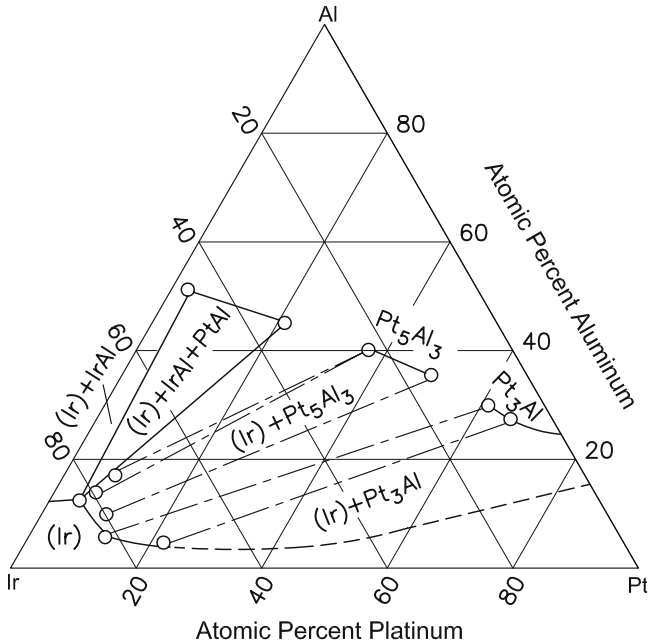

Fig. 2 Al-Ir-Pt partial isothermal section at 1500 °C [2003Yam]

References

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2003Yam: Y. Yamabe-Mitarai and H. Aoki, An Assessment of Ir-Pt-Al Alloys for High Temperature Materials, *J. Alloys Compd.*, 2003, **359**, p 143-152