

Al-Pt-Ti (Aluminum-Platinum-Titanium)

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An update of this ternary system by [2005Rag] briefly reviewed the experimental isothermal sections of [2001Hil] at 1350 °C and of [2000Din] at 950 °C. Recently, [2009Yan] clarified the phase relationships at 950 °C in the region around the Ti(Pt, Al)₂.

Binary Systems

In the partial phase relationships determined by [2009Yan], the only binary phases that appear are: Ti₃Al (D0₁₉, Ni₃Sn-type hexagonal, denoted α₂), and TiAl (L1₀, AuCu-type tetragonal, denoted γ). For a summary of the other binary phases, see [2005Rag].

Ternary Compounds

[2000Din] reported three ternary compounds in this system: τ₁ (fcc) around the composition Ti₂₆Pt₇Al₆₇, τ₂ (filled Mn₂₃Th₆-type cubic) around the composition TiPtAl₂ and τ₃ (MgZn₂-type hexagonal) around the composition Ti₄₄Pt₁₄Al₄₂. Extension of the work of [2000Din] by [2009Yan] showed that τ₃ in annealed samples is a superstructure based the MgZn₂-type Laves phase, with $a = \sqrt{3} \times a_{\text{MgZn}_2}$ and $c = c_{\text{MgZn}_2}$, space group *P6₃/mcm*, Nb(Ir,Al)₂-type. The MgZn₂-type phase was found only in as-cast samples. It disappeared on annealing. A fourth ternary phase τ₄ (TiPtAl) with the ordered Ni₂In-type (ZrBeSi-type) structure was found by [2009Yan], with lattice parameters of $a = 0.43925$ nm and $c = 0.54844$ nm. The site occupancies and interatomic distances were determined by [2009Yan] for both τ₃ and τ₄ phases.

Partial Isothermal Section at 950 °C

With starting metals of 99.9+% purity, [2009Yan] arc-melted under Ar atm 12 ternary alloys around the τ₃ composition. The alloys were annealed at 950 °C for 10 days and quenched in water. The phase equilibria were studied with optical microscopy, electron probe microanalysis, x-ray powder diffraction, and x-ray single-crystal diffraction. The partial isothermal section at 950 °C

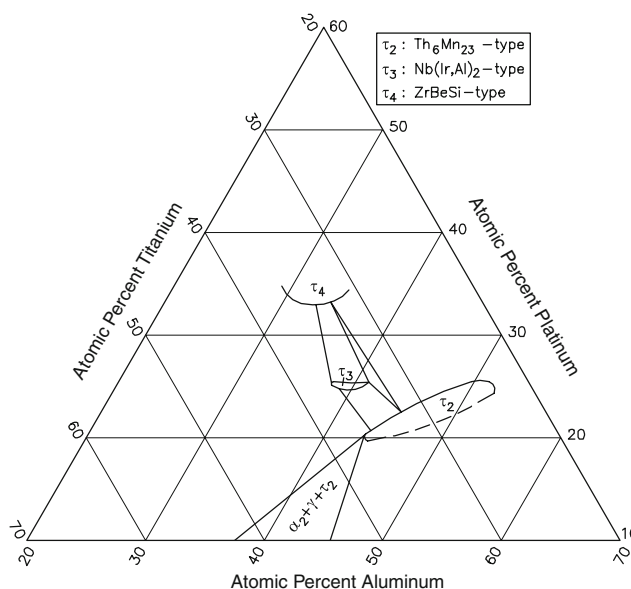


Fig. 1 Al-Pt-Ti partial isothermal section at 950 °C [2009Yan]

constructed by [2009Yan] is shown in Fig. 1. The τ₃ phase is present with a small homogeneity range around 25 at.% Pt, with a Ti-range of 33.5-36 at.%. It forms tie-lines with τ₂ and τ₄ phases. The composition of τ₁ phase falls outside the range investigated by [2009Yan].

References

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