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Al-Ni-Ti (Aluminum-Nickel-Titanium)

V. Raghavan

The update of this system by [2005Rag] reviewed the results of [1999Hun] (experimental isothermal section at 900 °C) and of [1999Zen] (computed liquidus surface and computed isothermal sections at 1200, 900 and 800 °C). Following a critical review of this system by [2006Sch], [2007Sch] presented new experimental results on the liquidus surface and isothermal sections at 1000 and 900 °C. These results were reviewed briefly by [2009Rag]. A more recent publication by [2009Bur] reported several three-phase equilibria at 1050 °C in the central part of the composition triangle, where the ternary phases lie.

Binary Systems

The intermediate phases in the three binary subsystems were summarized by [2009Rag]. The binary compounds that are present in the partial isothermal section at 1050 °C determined by [2009Bur] are: TiAl ($L1_0$, AuCu-type tetragonal, denoted γ), Ni_2Al_3 ($D5_{13}$-type hexagonal), and NiAl ($B2$, CsCl-type cubic).

Ternary Phases

The ternary phases in this system which have been reviewed in earlier reports are: τ_1 (nominal composition $Al_{13}Ni_2Ti_5$; $AuCu_3$-type cubic), τ_2 (Al_2NiTi; $Mn_{23}Th_6$-type cubic), τ_3 (AlNiTi; $MgZn_2$-type hexagonal), τ_4 ($AlNi_2Ti$; $AlCu_2Mn$-type cubic), and τ_5 ($Al_{65}Ni_{20}Ti_{15}$; unknown structure).

Partial Isothermal Section at 1050 °C

With starting metals of 99.9995% Al, 99.99% Ni and 99.99% Ti, [2009Bur] induction-melted under Ar atm eight ternary alloys in the central region of the composition triangle. The alloys were annealed at 1050 °C for 70 h and

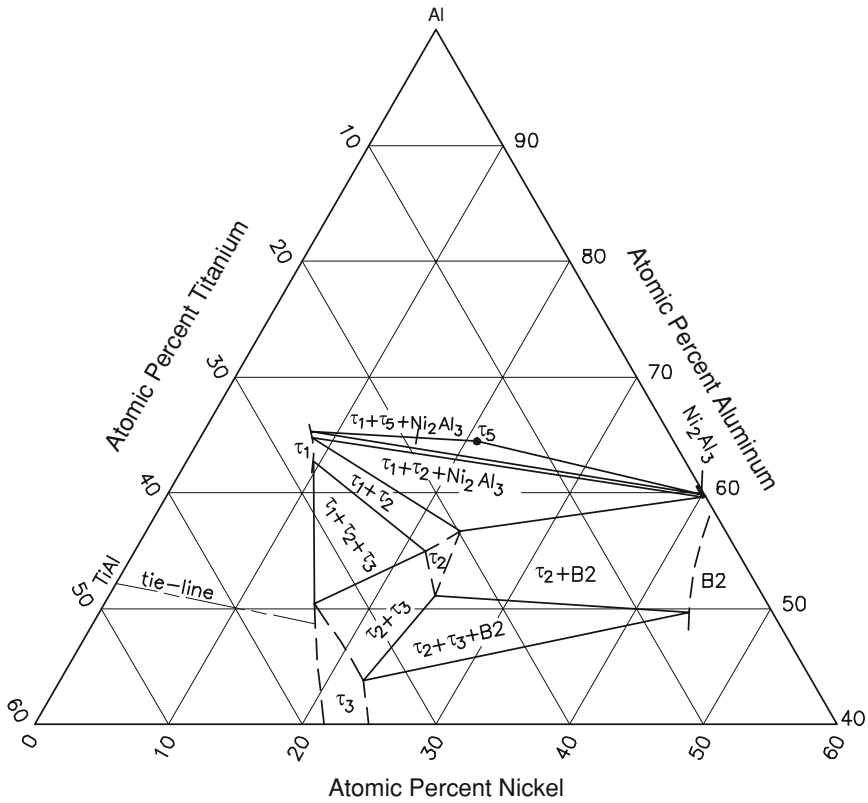

Fig. 1 Al-Ni-Ti partial isothermal section at 1050 °C [2009Bur]

quenched in water. The phase equilibria were studied by metallography, electron back-scatter diffraction and energy dispersive x-ray analysis. The tie-triangles determined by [2009Bur] at 1050 °C are shown in Fig. 1. They are the same as those determined by [2007Sch] at 1000 °C. The compositions of the coexisting phases are also close to the values determined by [2007Sch]. While confirming the existence of the τ_5 phase, [2009Bur] discounted the possibility of its being a decagonal phase. The structure of τ_5 still remains unknown.

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