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

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The data on this quaternary system are limited to the $B2$-$L2_1$-$B2$ phase boundaries in the Ni-rich part of the NiAl-NiTi-CuTi-CuAl plane of the composition tetrahedron [2002Ish].

Binary and Ternary Systems

An update of the Al-Ti phase diagram appears in this issue. For Al-Cu, Al-Ni, Cu-Ni, Cu-Ti, and Ni-Ti phase diagrams, see [Massalski2]. The binary phases NiAl and NiTi have the CsCl-type $B2$ structure.

Compilations of data on the Al-Cu-Ni, Al-Cu-Ti, Al-Ni-Ti, and Cu-Ni-Ti ternary systems are given in [1995Vil]. In the Al-Ni-Ti ternary system, the Heusler-type $L2_1$ phase Ni_2AlTi is present along the NiAl-NiTi join.

Quaternary Phase Equilibria

With starting metals of 99.99+ % Al, 99.9+ % Co, 99.9+ % Fe, and 99.5+ % Ti, [2002Ish] melted in an arc furnace under Ar atmosphere a limited number of alloy compositions that lie on the NiAl-NiTi-CuTi-CuAl plane. Diffusion couples prepared by welding were annealed at the desired temperatures. The compositions of the coexisting phases were measured by energy dispersive x-ray spectroscopy. The partial phase relationships on the NiAl-NiTi-CuTi-CuAl plane determined by [2002Ish] at 1300, 1200, and 1000 °C are redrawn in Fig. 1. The $B2$-$L2_1$ and $L2_1$-$B2$ phase boundaries are first-order in nature with a two-phase field present.

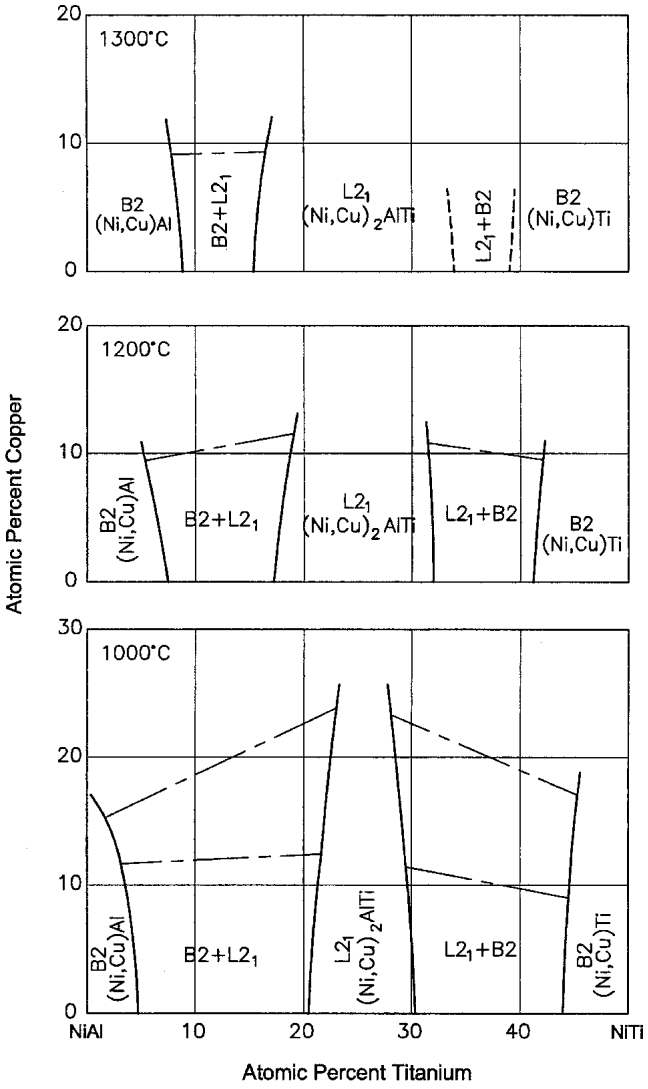

Fig. 1 Al-Cu-Ni-Ti partial $B2$-$L2_1$-$B2$ phase equilibria on the NiAl-NiTi-CuTi-CuAl plane of the composition tetrahedron [2002Ish]

References

1995Vil: P. Villars, A. Prince, and H. Okamoto, *Handbook of Ternary Alloy Phase Diagrams,* ASM International, Vol 3, 1995, p 3050-3063 (Al-Cu-Ni), Vol 3, p 3371-3383 (Al-Cu-Ti), Vol 4, p 4195-4216 (Al-Ni-Ti), and Vol 8, p 9846-9861 (Cu-Ni-Ti)

2002Ish: K. Ishikawa, R. Kainuma, I. Ohnuma, K. Aoki, and K. Ishida, Phase Stability of the X_2AlTi (X: Fe, Co, Ni and Cu) Heusler and $B2$-Type Intermetallic Compounds, *Acta Mater.,* Vol 50, 2002, p 2433-2443