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Al-Nb-Ni-V (Aluminum-Niobium-Nickel-Vanadium)

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For this quaternary system, [2006Sog] determined two isothermal sections at 1100 and 1000 °C on the Ni_3Al-Ni_3Nb-Ni_3V plane.

Binary Systems

For brief descriptions of the Al-Nb, Al-Ni, and Nb-Ni phase diagrams, see [2006Rag]. For brief descriptions of the Al-V and Ni-V phase diagrams, see [2005Rag]. The Nb-V phase diagram [Massalski2] depicts a continuous solid solution between Nb and V with a congruently melting minimum at 1860 °C.

Ternary Systems

For updates of the Al-Nb-Ni and Al-Ni-V ternary systems, see [2006Rag] and [2005Rag], respectively. The compilation of [1995Vil] gives an isothermal section at 1000 °C for the Al-Nb-V system. The review of the Nb-Ni-V system by [1991Gup] presents an isothermal section at 1050 °C.

Quaternary Phase Equilibria

With starting metals of 99.99 mass% Al, 99.9 mass% Nb, 99.9 mass% Ni, and 99.9 mass% V, [2006Sog] arc melted 20 quaternary alloys with a constant Ni content of 75 at.%. The alloys were annealed at 1100 or 1000 °C for 7 days and quenched in water. The phase equilibria were studied by optical and scanning electron microscopy, x-ray diffraction, and wavelength dispersive spectroscopy. The measured compositions of the phases in equilibrium were listed. The isothermal sections constructed by them at a constant Ni content of 75 at.% at 1100 and 1000 °C are shown in Fig. 1 and 2. At 1100 °C (Fig. 1), the Ni_3Nb-based $D0_a$ phase forms tie-lines with the Ni_3Al-based $L1_2$ phase as well as with the face-centered cubic (fcc) solid solution at the "Ni_3V" corner. At 1000 °C (Fig. 2), the Ni_3V-based $D0_{22}$ phase is present in place of the fcc solid solution.

References

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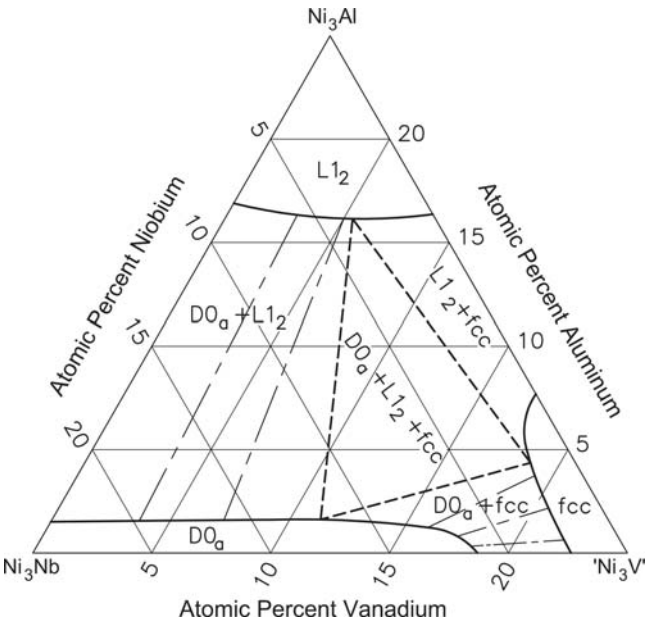

Fig. 1 Al-Nb-Ni-V isothermal section at 75 at.% Ni and at 1100 °C [2006Sog]

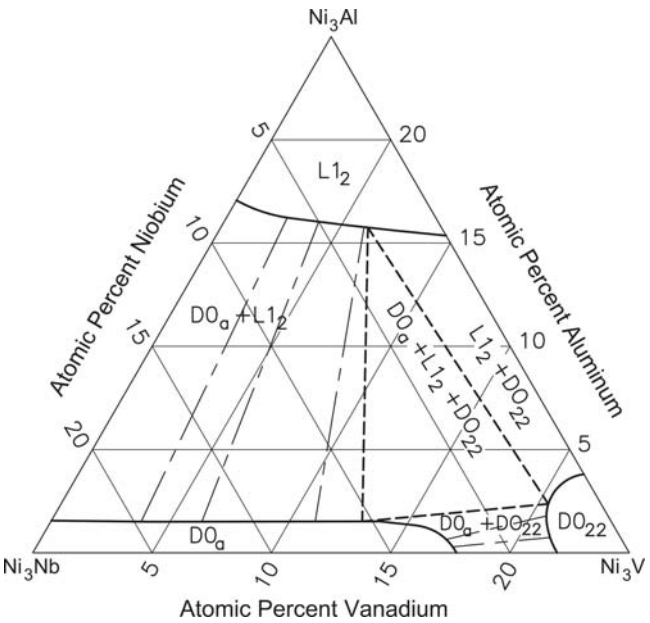

Fig. 2 Al-Nb-Ni-V isothermal section at 75 at.% Ni and at 1000 °C [2006Sog]