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# Al-Nd-Ti (Aluminum-Neodymium-Titanium)

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Recently, [2004Zho] determined an isothermal section at 500 °C for this ternary system, which depicts two ternary compounds found earlier by [1995Nie1,2].

## Binary Systems

The Al-Nd phase diagram reassessed with new additional experimental input by [2005Gao] shows the following intermediate compounds: $Nd_3Al$ ($D0_{19}$, $Ni_3Sn$-type hexagonal), $Nd_2Al$ ($C23$, $Co_2Si$-type orthorhombic), NdAl (ErAl-type orthorhombic), $NdAl_2$ ($C15$, $MgCu_2$-type cubic), $\beta NdAl_3$ (stable between 1205 and 888 °C), $\alpha NdAl_3$ ($Ni_3Sn$-type hexagonal), $NdAl_4$ or $\beta Nd_3Al_{11}$ ($D1_3$, $Al_4Ba$-type tetragonal), and $\alpha Nd_3Al_{11}$ ($\alpha La_3Al_{11}$-type orthorhombic). Recently, [2006Sch] reviewed the Al-Ti phase diagram. The intermediate phases stable at 500 °C are: $TiAl_3$ (tetragonal, space group $I4/mmm$), $TiAl_2$ ($HfGa_2$-type tetragonal), TiAl ($L1_0$, AuCu-type tetragonal), and $Ti_3Al$ ($D0_{19}$, $Ni_3Sn$-type hexagonal). There are no intermediate phases in the Nd-Ti system. At 500 °C, (αTi) and (αNd) show very little mutual solubility.

## Ternary Compounds

Two ternary compounds are known in this system. $NdTi_2Al_{20}$ (denoted $\tau_1$ here) is cubic, $Fd\bar{3}m$, $Z = 8$, $a = 1.4704$ nm [1995Nie1]. $Nd_6Ti_4Al_{43}$ (denoted $\tau_2$ here) is hexagonal, $P6_3/mcm$, $Z = 2$, $a = 1.1124$ nm and $c = 1.8069$ nm [1995Nie2].

## Ternary Isothermal Section

With starting metals of purity > 99.9 mass %, [2004Zho] arc-melted 150 alloys in Ar atm. The alloy samples were given a final anneal at 500 °C for 150 h and quenched in liquid nitrogen. The phase equilibria were studied with x-ray powder diffraction, scanning electron microscopy, and differential thermal analysis. The isothermal section at 500 °C constructed by [2004Zho] is shown in Fig. 1. The two ternary compounds $\tau_1$ and $\tau_2$ are present at 500 °C. The solubility of Ti in the binary phases of $Nd_3Al$, $Nd_2Al$ and $NdAl_2$ is up to 2.4, 3.5, and 16.1 at.% respectively. The solubility of Nd in Ti, $Ti_3Al$, and TiAl is less than 1 at.%.

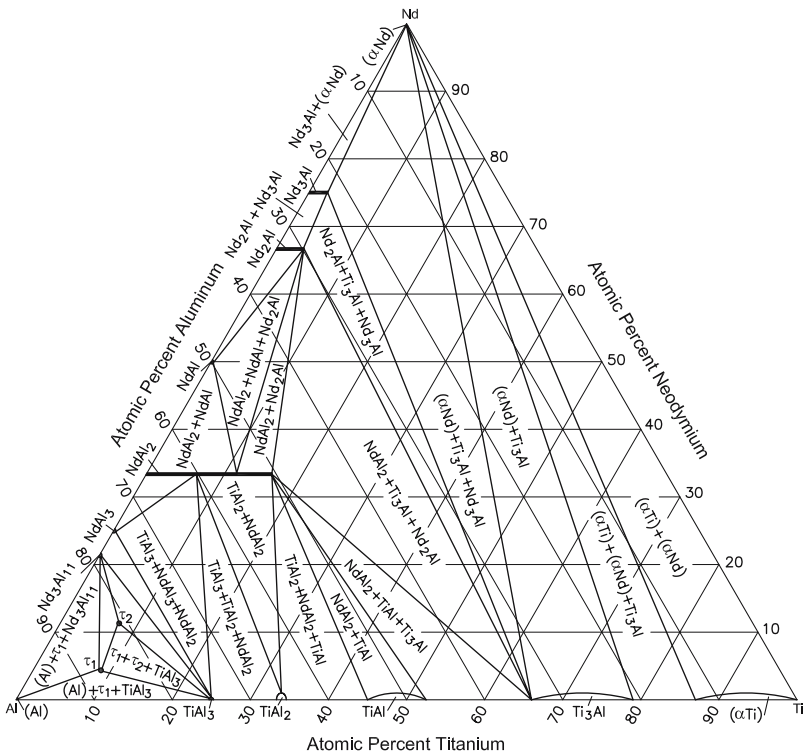


**Fig. 1** Al-Nd-Ti isothermal section at 500 °C [2004Zho]. Narrow two-phase regions are omitted

## References

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