Solid Solutions in the $PrNi_2$-$PrAl_2$-$PrGe_2$ System

Nataliya Lyaskovska, Roman Gladyshevskii, *Department of Inorganic Chemistry, Ivan Franko National University of Lviv, Ukraine*. E-mail: NataliyaMuts@org.lviv.net

The isothermal cross-section of the phase diagram of the system Pr-Ni-Al-Ge at 33.3 at.% Pr in the $PrGe_2$-rich region at 600°C was constructed. The unit-cell parameters and homogeneity ranges of the solid solutions based on the binary compound $PrGe_{2-x}$ with an α-$ThSi_2$-type structure and the ternary compounds PrAlGe (α-$ThSi_2$-type structure) and $Pr(Ni,Ge)_{2-x}$ (AlB_2-type structure) were determined. For the solid solution with AlB_2-type structure it was found that the progressive substitution of Ge for Ni or Al deforms the trigonal prisms. This deformation can be interpreted as the result of increasing interactions between *p*-element atoms in the (0 0 1) plane with increasing Ge content. On the contrary, both unit-cell parameters monotonically increase when Ni atoms are replaced by larger Al atoms. The structural investigation of a single crystal from an alloy of composition $Pr_{33.3}Ni_{13.3}Al_{33.3}Ge_{20.0}$ indicates that the crystal structure is incommensurately modulated in the directions of [0 1 0] and [0 0 1] of the parent AlB_2-type structure (a = 4.255(2), c = 4.221(2) Å, q_1 = 0.169**b***, q_2 = 0.154**c***).

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