

Short and Medium-Range Order in Liquid Ternary $\text{Al}_{80}\text{Co}_{10}\text{Ni}_{10}$, $\text{Al}_{72.5}\text{Co}_{14.5}\text{Ni}_{13}$, and $\text{Al}_{65}\text{Co}_{17.5}\text{Ni}_{17.5}$ Alloys

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A local short-to-intermediate range order of liquid $\text{Al}_{80}\text{Co}_{10}\text{Ni}_{10}$, $\text{Al}_{72.5}\text{Co}_{14.5}\text{Ni}_{13}$, and $\text{Al}_{65}\text{Co}_{17.5}\text{Ni}_{17.5}$ alloys was examined by X-ray diffraction and the reverse Monte Carlo modelling. The comprehensive analysis of three-dimensional models of the liquid ternary alloys was performed by means of the Voronoi-Delaunay method. The existence of a prepeak on the $S(Q)$ function of the liquid alloys is caused by medium range ordering of $3d$ -transition metal atoms in dense-packed poly-tetrahedral clusters at temperatures close to the liquidus. The non-crystalline clusters, represented by aggregates of pentagons that consist of good tetrahedra, and chemical short-range order lead to the formation of the medium range order in the liquid binary Al-Ni, Al-Co and ternary Al-Ni-Co alloys.

Key words: High-Temperature Alloys; Atomic Scale Structure; X-Ray Diffraction;
Computer Simulations; Prepeak.