

**DETERMINATION OF TEMPERATURE AND  
COMPOSITION AREAS OF SOLID SOLUTION IN  
Fe-Ni-Co-(Cu,Cr) SYSTEM**

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The work is devoted to the determination of temperature and composition area of solid solution, existed at Fe-Ni-Co-(Cu,Cr) system. It is well-known, that alloys of this system are the new type of materials, characterized by high entropy of mixing. Design of high entropy alloys (HEAs) with desired properties is modern trend in materials science nowadays, and number of articles, related to the discussed topic, is constantly increasing. Authors of the current work came down to the design and analysis of HEAs from the thermodynamic point of view, based on the own experience in experimental investigation of phase diagrams of multicomponent metallic systems [1,2].

Research is provided with the use of classical physico-chemical methods of phase diagram construction, namely, differential thermal analysis, electron probe microanalysis, X-ray diffraction analysis and scanning electron microscopy. During the first step of research the liquidus and solidus surface projections of the Fe-Ni-Co-Cu quaternary system have been constructed. There were defined the limits of solid-state miscibility gap and tie-lines location within the discussed miscibility gap. In such a way we defined the area of quaternary solid solution, within the volume of that the HEAs can be synthesized. The next step of research is determination of temperature and composition areas of solid solution in Fe-Ni-Co-(Cu,Cr) system. The effect of addition of Cu and Cr on the structure, phase composition and properties of obtained alloys has been shown. Obtained information could be useful as basis for design of HEAs.

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  2. Starykh R.V., Sineva S.I. Study of the liquidus and solidus surfaces of the quaternary Fe-Ni-Cu-S system: V. Refinement and addition of the data on the ternary Fe-Ni-S and Fe-Ni-Cu phase diagrams // Russian Metallurgy, vol.2012. 3 pp.189-194.