BOOK OF ABSTRACTS

VIIITH INTERNATIONAL SAMSONOV CONFERENCE

"MATERIALS SCIENCE OF REFRACTORY COMPOUNDS"

(MSRC-2022)

24 - 27 May 2022

Kyiv, Ukraine

Thermodynamic Properties Of Liquid Glass-Forming Alloys Of Multicomponent Early With Late Transition Metals Systems

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Interest on the thermodynamic properties of liquid alloys of hafnium, titanium, zirconium – early transition metals (ETMs) with cobalt, nickel, and copper – late transition metals (LTMs) concerns the development and production of rapidly quenched and bulk amorphous alloys. Also, this information is necessary for the effective development of new materials, such as crystalline and amorphous high entropy alloys. The thermodynamic mixing functions of multicomponent liquid alloys were calculated using a thermodynamic database for the Co–Cu–Ni–Ti–Zr–Hf glass-forming system. The database was developed in the spirit of CALPHAD approach. The parameters of the database were generated using experimental data on the thermodynamic mixing functions of liquid alloys in constituent binary and ternary systems. As the thermodynamic mixing functions of binary and ternary liquid alloys formed by ETMs and LTMs demonstrate strong negative deviations from Raoult's law the associate solution model was used for their modelling. The concentration and temperature dependencies of the thermodynamic functions such as mixing enthalpy, excess mixing entropy and Gibbs energy, and mixing entropy and Gibbs energy of the Co−Cu−Ni−Ti−Zr and Co−Cu−Ni−Ti−Hf liquid alloys were analyzed. It was shown that the negative deviations from ideality increase with decreasing temperature. The important role of the pair interactions between ETMs and LTMs in definition of concentration dependence of the excess thermodynamic functions was demonstrated. The mixing Gibbs energy and it's contributions were calculated for 6 equiatomic quinary liquid alloys of the Co–Cu–Ni–Ti–Zr–Hf glass-forming system. The contribution of the ideal component of the mixing Gibbs energy was analyzed in the interval of temperature from 800 to 1873 K.

Acknowledgments

This work was supported by the Ministry of Education and Science of Ukraine under the grant 0122U000970.