THERMODYNAMIC MODELING OF HIGH-TEMPERATURE OXIDATION OF $Al_xCoCr_yNiNb_z$ HIGH-ENTROPY ALLOYS

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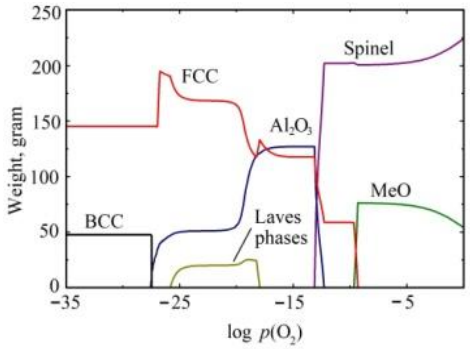
High-entropy alloys (HEAs) consist of five or more elements in near-equiatomic ratios to achieve maximum configurational entropy of mixing. This concept allows designing a wide variety of compositions and can assist in obtaining materials with unique characteristics. It is known that $Al_xCoCr_yNiNb_z$ type HEAs exhibit an optimal combination of strength and ductility and can be used to produce critical components for shipbuilding or aerospace industries [1]. For aerospace applications, the parts are constantly exposed to elevated temperatures. Therefore, niobium-containing HEAs are of particular interest for research into high-temperature oxidation resistance.

Thermodynamic modeling of the high-temperature oxidation process of alloys can optimize and significantly contribute to research in this field. This modeling is performed using the Calphad methodology, for which we applied the FactSage software package (version 7.3). We used data from the SGTE (2011) database to model the metallic phases, and the FToxid database, supplemented by FactPS data, to model the oxide phases. An example of the results of this calculation is shown in the figure below.



Results of thermodynamic modeling of high-temperature oxidation of $AlCoCrNiNb_{0.2}$ HEA at 1100 °C

1. Pan B., Xu X., Yang J., Zhan H., Feng L., Long Q., Yao Q., Deng J., Cheng L., Lu Z., Zhou H. Effect of Nb, Ti, and V on wear resistance and electrochemical corrosion resistance of $AlCoCrNiM_x$ (M=Nb, Ti, V) high-entropy alloys // Mater. Today Commun. 2024. Vol. 39. P. 109314. https://doi.org/10.1016/j.mtcomm.2024.109314

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