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Theoretical evaluation of solid solution interaction in $Fe_x(CoCrMnNi)_{100-x}$ medium- and high-entropy alloys

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Abstract

Solid solution interaction in medium- and high-entropy of $Fe_x(CoCrMnNi)_{100-x}$ (x=20, 40, 50, and 60 at. %) alloys was evaluated theoretically. The different Fe contents were found to affect the yield strength (σ_y) of the $Fe_x(CoCrMnNi)_{100-x}$ system, with higher Fe content leading to reduced σ_y. The focus of this study was to investigate, using various theoretical approaches, the effect of different Fe contents on the solid solution interaction in the $Fe_x(CoCrMnNi)_{100-x}$ system. The theoretical approaches demonstrated a decreasing atomic size misfit with increasing Fe content, which reduced lattice distortion. The critical resolved shear stress for slip to occur also decreased with increasing Fe content, leading to the least solid solution contribution with higher Fe content in the $Fe_x(CoCrMnNi)_{100-x}$ system. The solid solution interaction of the $Fe_x(CoCrMnNi)_{100-x}$ system at lower temperature was also observed, showing good agreement with the reresults obtained at room temperature.

Previous Next

Keywords

interaction

[1] Equally contributed to this work.