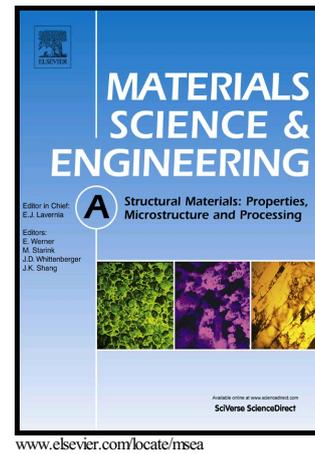


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Precipitation and its strengthening of Cu-rich phase in CrMnFeCoNiCu_x high-entropy alloys

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Abstract

The effects of Cu addition on the phase change and mechanical properties of CrMnFeCoNiCu_x high-entropy alloy were investigated. The results indicated that there was an evolution of phase structure from fcc1 to fcc2 with the increase of Cu content. The fcc2 was identified to be (Cu, Mn)-rich phase by scanning electron microscopy and transmission electron microscopy. In the alloys with high amount of Cu, Cu-depleted dendrites and (Cu, Mn)-rich inter-dendrites was observed, due to the positive mixing enthalpy between Cu and other elements in the alloy. The yield strength and microhardness increased with increasing Cu content. The yield strength increased from 188.04 MPa for Cu0 to 350.63 MPa for Cu1 alloy. The microhardness increased from 165.35 Hv to 215.84 Hv. The high strength of CrMnFeCoNiCu alloy was attributed to the uniformly dispersed nano-size Cu-rich precipitates in the matrix, which impeded the dislocation motion during alloy deformation. The Cu-added CrMnFeCoNiCu_x alloys also showed excellent strain hardening ability during compression test.

Keywords: High-entropy alloy; Microstructure; Yield strength; Precipitation Strengthening

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