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Effect of aluminum contents on the microstructure and properties of $Al_xCoCrFeNi$ alloys

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Abstract

In 2004, Yeh et al. put forward a total innovative conceptual component design. The researcher added more than 5 components with a near equimolar ratio to the alloys. And the alloys were named as high-entropy alloys (HEAs). Studies showed that simple solid solution phase usually appeared, rather than intermetallic compounds in HEAs. Those phases empowered the alloy with high hardness, excellent resistance to temper softening, good ductility and corrosion resistance. In this study, $Al_xCoCrFeNi$ alloys with multiprincipal elements (x = 0, 0.25, 0.75, 1.25 and 2) are prepared by using an induction-melting. With increasing *x*, the $Al_xCoCrFeNi$ alloys change from single FCC phase to single BCC phase with a transition duplex FCC/BCC region. Their microstructure and mechanical properties are investigated. This result confirms that Al promotes the formation of BCC structure. The increase of x leads to distortion of the crystalline lattice and the alloy strengthening. The highest hardness (700 HV) is achieved by x=0.75 which the structure changes from FCC to FCC+BCC.

Keywords: High entropy alloys; Microstructure; Properties; Aluminium content