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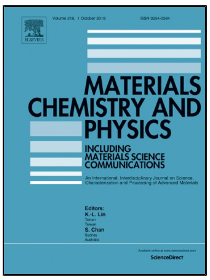

Grouping strategy in eutectic multi-principal-component alloys

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Grouping strategy in eutectic multi-principal-component alloys

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Abstract: Eutectic high entropy alloys (EHEAs) have shown promising mechanical properties and good castability. However, designing EHEAs is still a challenge because of highly complex chemical compositions and limited multiple phase diagrams. Here, we propose a grouping strategy to design EHEAs efficiently based on the distributions of mixing enthalpies of atom-pairs in multi-principal-component alloys. Following this idea, a new $CoCrFeNiTa_{0.43}$ EHEA is designed successfully. Moreover, those reported EHEAs are reviewed and show high consistence with the strategy proposed here.

Keywords: high entropy alloys; eutectic; design

1. Introduction

High entropy alloys (HEAs) are metallic materials with a brand-new design strategy: multi-principal-components without any base elements [1-4]. Typically, CoCrMnFeNi HEA shows single face centered cubic (FCC) solid solution with excellent ductility and fracture toughness [5-7] while VNbMoTaW HEA shows body centered cubic (BCC) solid solution with high strength [8]. Plenty of investigations indicated that FCC HEAs have good radiation resistance [9] and intriguing plastic deformation mechanism [10, 11] while the BCC HEAs exhibit very high strength at high temperatures [12] and good biocompatibility [13]. However, the balance of ductility and strength for these single phase HEAs needs to be further improved. As an option,

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