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Strengthening of Fe₄₀Mn₄₀Co₁₀Cr₁₀ high entropy alloy via Mo/C alloyingR. Wei¹, H. Sun¹, Z.H. Han², C. Chen¹, T. Wang¹, S.K. Guan¹, F.S. Li^{1*}¹*School of Materials Science and Engineering, Zhengzhou University, Zhengzhou 450001, China*²*School of Materials Science and Engineering, Xi'an University of Technology, Xi'an 710068, China** *Corresponding author. fsli@zzu.edu.cn (F.S. Li)*

Abstract The effects of the addition of Mo and C elements on the microstructure and room-temperature mechanical properties of Fe₄₀Mn₄₀Co₁₀Cr₁₀ high-entropy alloy (HEA) were investigated. The yield strength of the HEA increased from 240 MPa to 560 MPa through the addition of 1 wt% Mo and 1 wt% C. The strengthening mechanism of the HEA was found to be mainly attributed to the solid-solution strengthening. Surprisingly, the addition of Mo and C also prompt the deformation twinning in the HEA, which enhances the working hardening ability and basically maintains the large plasticity.

Keywords: Metals and alloys; High-entropy alloys; Deformation and fracture; Mechanical properties; Solid-solution strengthening.

1. Introduction

Face-centered-cubic (FCC) structured high-entropy alloys (HEAs) are currently receiving extensive attentions due to their excellent ductility and high fracture toughness [1-5]. However, the plasticity of the HEAs is often surplus while their strength is generally insufficient. Consequently, fine-grain strengthening [6] and precipitation strengthening [7] have been introduced to improve the strength of the HEAs, however these tactics are accompanied by obvious decrease in plasticity. Recently, substitution Mo [8] or interstitial C [5, 9] strengthening offers another route to improve their

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