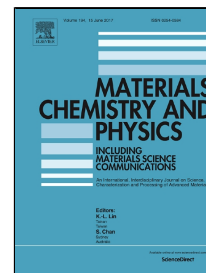


# Accepted Manuscript

Influence of compositional inhomogeneity on mechanical behavior of an interstitial dual-phase high-entropy alloy



Zhiming Li, Dierk Raabe

PII: S0254-0584(17)30331-0

DOI: 10.1016/j.matchemphys.2017.04.050

Reference: MAC 19655

To appear in: *Materials Chemistry and Physics*

Received Date: 18 March 2017

Revised Date: 18 April 2017

Accepted Date: 24 April 2017

Please cite this article as: Zhiming Li, Dierk Raabe, Influence of compositional inhomogeneity on mechanical behavior of an interstitial dual-phase high-entropy alloy, *Materials Chemistry and Physics* (2017), doi: 10.1016/j.matchemphys.2017.04.050

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

# Influence of compositional inhomogeneity on mechanical behavior of an interstitial dual-phase high-entropy alloy

Zhiming Li, Dierk Raabe

Max-Planck-Institut für Eisenforschung, Max-Planck-Str. 1, 40237 Düsseldorf, Germany

Correspondence to: zhiming.li@mpie.de (Z. Li); d.raabe@mpie.de (D. Raabe)

## Abstract

In this study we present and discuss the influence of compositional inhomogeneity on the mechanical behavior of an interstitially alloyed dual-phase non-equiatomic high-entropy alloy ( $\text{Fe}_{49.5}\text{Mn}_{30}\text{Co}_{10}\text{Cr}_{10}\text{C}_{0.5}$ ). Various processing routes including hot-rolling, homogenization, cold-rolling and recrystallization annealing were performed on the cast alloys to obtain samples in different compositional homogeneity states. Grain sizes of the alloys were also considered. Tensile testing and microstructural investigations reveal that the deformation behavior of the interstitial dual-phase high-entropy alloy samples varied significantly depending on the compositional homogeneity of the specimens probed. In the case of coarse-grains ( $\sim 300\ \mu\text{m}$ ) obtained for cast alloys without homogenization treatment, ductility and strain-hardening of the material was significantly reduced due to its compositional inhomogeneity. This detrimental effect was attributed to preferred deformation-driven phase transformation occurring in the Fe enriched regions with lower stacking fault energy, promoting early stress-strain localization. The grain-refined alloy ( $\sim 4\ \mu\text{m}$ ) with compositional heterogeneity which was obtained for recrystallization annealed alloys without homogenization treatment was characterized by almost total loss in work-hardening. This effect was attributed to large local shear strains due to the inhomogeneous planar slip. These insights demonstrate the essential role of compositional homogeneity through applying corresponding processing steps for the development of advanced high-entropy alloys.

**Key words:** High-entropy alloy; compositional homogeneity; mechanical properties; dual phase; transformation-induced plasticity.

Download English Version:

<https://daneshyari.com/en/article/7921850>

Download Persian Version:

<https://daneshyari.com/article/7921850>

[Daneshyari.com](https://daneshyari.com)