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Evolution of the phase structure after different heat treatments in NiCoFeCrGa High Entropy Alloy

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The non-equilibrium nature of a two-phase NiCoFeCrGa high entropy alloy (HEA) is studied by analyzing its microstructures after different heat-treatment conditions. The microstructure - containing a mixture of well-separated FCC and BCC regions – of the as-cast alloy has changed strongly by heat-treatment for 1 h at 1150 K, significantly changing the ratio of the volume fraction of the FCC and BCC phases. Needle like BCC phase particles evolved inside the original FCC regions when cooling the heat-treated samples to room temperature by rapid or medium rates. In the case of slow cooling, the original BCC regions transformed into a mixture of a matrix and cube-like BCC phase precipitates, which can be attributed to the effect of the transition between para- and ferromagnetism around the Curie-point. There is also an unambiguous correlation between the cooling rate and mechanical properties of the heat-treated alloys.

Keywords: High Entropy Alloys, Microstructure, Mechanical properties, Cooling rate, Phase transformations.

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1. Introduction

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