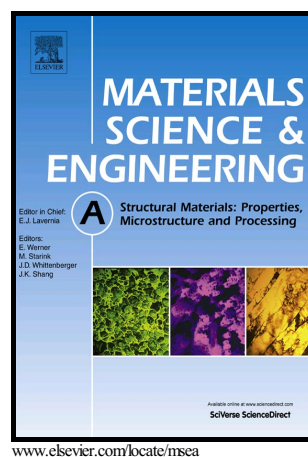


ON THE MICROSTRUCTURE AND
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THE SEMI-SOLID STATE

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ON THE MICROSTRUCTURE AND MECHANICAL PROPERTIES OF AlCoCrCuNi HIGH ENTROPY ALLOY PROCESSED IN THE SEMI-SOLID STATE

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Abstract

After semi-solid processing the thixo-cast microstructure consisted of a unique composition of globular grains with a B2-ordered body centered cubic structure (BCC) within coherent nano-cuboidal precipitations (average size of 60 nm) were presented. The grains contained near equiatomic concentrations of Al, Co, Cr and Ni. They were surrounded by a Cu-enriched homogeneously distributed solid solution with an $L1_2$ - ordered structure and Co-Cr nano-precipitations. The complex microstructure was responsible for the high strength and moderate ductility at room temperature, which was confirmed by compression test results. The thixo-cast revealed a yield strength of 1580 MPa, while its compression strength at 6% of strain reached 2070 MPa at an average hardness of 581 HV. The obtained values of yield strength and hardness were about 20% higher than those of the ingot material after direct casting. The melting behavior, microstructure and mechanical properties obtained make the AlCoCrCuNi HEA a promising material for thixoforming.

Keywords

Thixoforming, semi-solid processing, high entropy alloys, TEM

1 Introduction

Compositionally complex alloys consisting of five or more principal elements, frequently referred to as high-entropy alloys (HEAs), have received considerable attention in the material science community over the last few years [1-3]. They consist of five or more elements with concentrations of 5 to 35 at.%. Such a composition leads to a decrease in the Gibbs free energy stabilizing the solid

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