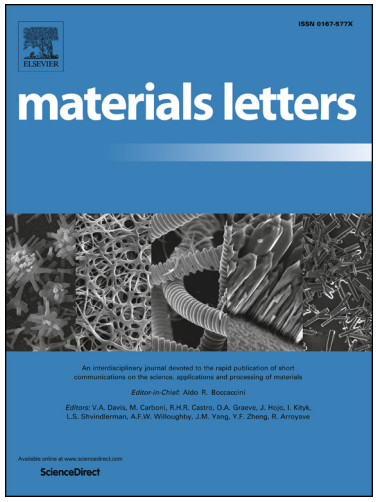

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Fabrication of ceramics/high-entropy alloys gradient composites by combustion synthesis in ultra-high gravity field

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ABSTRACT

The gradient ceramic/metal composite of TiC-TiB_2/$Al_{0.3}$CoCrFeNi was prepared by combustion synthesis under ultra-high gravity field. Right after the formation of the mixture by combustion, the ceramics and metals are separated in an ultra-gravity field due to the difference in mass density, resulted in a gradient distribution of ceramics (TiC-TiB_2) along the gravitational field in the high-entropy alloy ($Al_{0.3}$CoCrFeNi) matrix. The hardness of the material shows a significant gradient change.

Keywords: Gradient composites; Ceramic composites; Combustion synthesis; Ultra-high gravity; High-entropy alloy; Functional

1. Introduction

Recently, high-entropy alloys (HEAs), which contain at least four principal metals, have been explored and attracted more and more attentions [1, 2]. Compared with conventional alloy materials, HEAs possess excellent structural stability and comprehensive properties because of the high entropy effect and sluggish diffusion effect [3, 4]. Thus, HEAs become a focus in many fields of scientific research, such as heat-resistant HEAs, cryogenic HEAs, HEA wire, HEA film, high entropy ceramics, superconducting HEAs, eutectic HEAs, etc. [5-7]. However, due to the limitations of the preparation technology, ceramic/HEAs gradient composites, which combine the advantages of ceramics and high-entropy alloys, have been rarely reported, although they are desirable for protective structural materials including armor and aerospace shell materials.

In this LETTER, a novel method has been adopted to prepared TiC-TiB_2/ $Al_{0.3}$CoCeFeNi gradient composites by ultra-high gravity combustion synthesis, an efficiently approach to produce ceramics,