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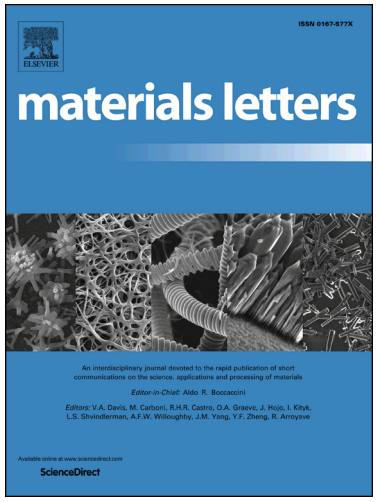

Fabrication of ZrB_2-ZrC composite nanofibers with eutectic composition by electrospinning and carbothermal reduction

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Fabrication of ZrB_2-ZrC composite nanofibers with eutectic composition by electrospinning and carbothermal reduction

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Abstract: Addition of ZrC to ZrB_2 is favored to improve the fracture toughness of ZrB_2. In this paper, ZrB_2-ZrC composite nanofibers with eutectic composition are fabricated by electrospinning and carbothermal reduction. The precursors prepared by electrospinning are smooth and uniform. ZrB_2-ZrC composite nanofibers could be fabricated by heat-treatment of precursors at 1300℃ in argon. Heat-treatment temperature influences the crystalline structure and grain size of nanofibers. The diameter of ZrB_2-ZrC composite nanofibers is about 250nm. The mole ratio of ZrB_2 and ZrC in the nanofibers is 47:53, very close to the eutectic composition of ZrB_2-ZrC composites. Some amorphous carbon is present in the nanofibers. The effect of heat-treatment temperature on amorphous carbon content is analyzed. The interface between ZrB_2 and ZrC nano-grains is characterized.

Keywords: ZrB_2-ZrC composite nanofibers; Eutectic composition; Electrospinning; Fibre technology; Microstructure

1. Introduction

Zirconium diboride (ZrB_2) possesses properties of low density, high melting point and strength, exceptional thermal and electrical conductivity [1]. It has wide applications in harsh environment such as hypersonic flight and aircraft engines [2]. However, the low fracture toughness and poor high-temperature stability have limited its applications [3]. In the past decades, many studies have been done on the