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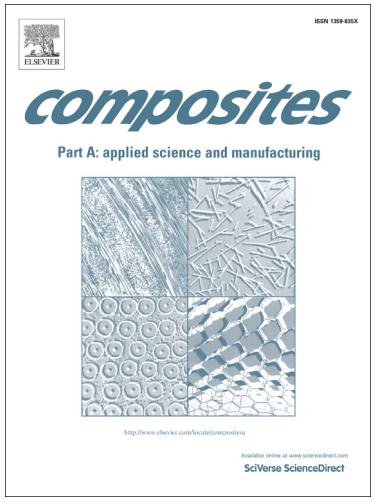

Oxide-fibre/high-entropy-alloy-matrix composites

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OXIDE-FIBRE/HIGH-ENTROPY-ALLOY-MATRIX COMPOSITES

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Abstract

A new type of composites containing eutectic oxide fibres and a high entropy alloy (HEA) with a melting point of about 1450°C as the matrix is obtained via liquid infiltration route. A low pressure of argon gas necessary to infiltrate a fibre bundle with the molten matrix alloy is an evidence of good wetting in this system that provides a sufficiently high strength to the fibre/matrix interface. Composite specimens were tested to measure the strength at 20 - 1300°C. It was found that the composite strength does not decrease to a temperature of 1200°C. The analysis of the microstructure and strength data suggests an expectation of a high creep resistance of the composites under development.

Keywords: A. Metal-matrix composites (MMCs), B. Strength, E. Liquid metal infiltration

1. Introduction

Enhancing the use temperature of structural materials is an important aim of modern materials science. One way to reach this goal is to develop metal matrix composites (MMCs). Single crystalline and eutectic oxide fibres crystallised from the melt by the internal crystallisation method (ICM) are appropriate reinforcements for composites to be used at temperatures up to about 1600°C [1]. Up to now, a choice of matrix materials has been limited to nickel-based alloys [2,3] and molybdenum alloys [4].

The usage of molybdenum as the matrix is an easiest way to produce oxide-fibre/metal-matrix composites [1,5] but Mo-containing composites require a special attention to prevent oxidation [4]. A nickel-based matrix limits the use temperature of composites by a temperature of about 1200°C and this is an inherent limitation because of a relatively low solidus temperature of nickel alloys. Another problem arising whith using a nickel alloy as the matrix is poor wetting of oxides with

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