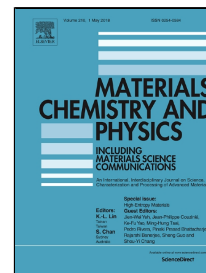


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Porous and non-porous Alumina reinforced Magnesium Matrix Composite through Microwave and Spark plasma sintering processes

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Abstract

In this study, Alumina reinforced Magnesium Matrix Composites have been prepared by two different sintering method: microwave and spark plasma sintering (SPS) processes. 5wt% alumina whisker was blended with magnesium powders in ethanol media for 10 minutes. The sintering temperatures in the spark plasma and microwave furnace were at 420° and 700°C, respectively. Thermodynamic investigation and XRD results revealed the formation of MgO, Mg₂Al₃ compounds in both sintered composites. However, microwave sintering led to form a porous composite (53.1% of theoretical density) while SPS resulted to formation of a fully dense composite. The mechanical examinations showed higher bending strength (163±10 MPa) and micro-hardness (101±11 Vickers) of SPS samples rather than microwave samples as it expected. By using two different sintering methods (pressure-less and pressure-assisted) and controlling processing parameters, the porosity of the final products can be changed from porous to fully dense composites.

Keywords: Alumina; Porous structure; Spark plasma sintering; Microwave.

1. Introduction

The light weight metal matrix composite (MMC) plays effective roles in industries which are involved with development in energy utilization improvement such as aerospace and automotive. Therefore magnesium and its alloys are accounted as one of the most interested matrix in light weight composites due to low density compared to steel, aluminium and titanium [1, 2]. These types of composites offer high amounts of specific strength. However

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