Pertanika J. Sci. & Technol. 31 (3): 1493 - 1502 (2023)

PERTANIKA JOURNALS

SCIENCE & TECHNOLOGY

Journal homepage: http://www.pertanika.upm.edu.my/

The Effect of Graphene Nanoplatelets Content on the Hardness of Mg6%Zn0.2%Mn Composites

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ABSTRACT

The effect of graphene nanoplatelets (GNPs) content on the hardness of magnesium-based composites was studied. A magnesium-based composite, Mg6%Zn0.2%Mn with graphene nanoplatelets (GNPs), was fabricated via powder metallurgy process at room temperature and compressive pressures of 50kN for 20 minutes, which was then sintered at 500°C for 2 hours. It produced significant grain refinement microstructure. The change in microstructure was examined by 3D microscope analysis, and the hardness value was evaluated using the Vickers microhardness apparatus. This study demonstrated the importance of GNPs reinforcement with zinc and manganese for microhardness analysis in the sintered Mg-based GNPs composites. It also portrayed their influence on grain refinement of the microstructure. The hardness results agreed with the microstructure results, proving that the presence of GNPs increases the hardness of the Mg-based composites.

Keywords: Graphene nanoplatelets, magnesium-based composites, microhardness test, powder metallurgy

ARTICLE INFO

Article history:
Received: 02 July 2022
Accepted: 05 October 2022
Published: 31 March 2023

DOI: https://doi.org/10.47836/pjst.31.3.20

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INTRODUCTION

Magnesium (Mg) is one of the most abundant metals present in the Earth's crust. Mg is the lightest of all the engineering metals, having a density of 1.74 g/cm^3. It is 35% lighter than aluminium (2.7 g/cm^3), 60% lighter than titanium and over four times lighter than steel (7.86 g/cm^3) (Mordike & Ebert, 2001). Mg has become desirable engineering material in every specific application, especially in automotive industries, with its

ISSN: 0128-7680
e-ISSN: 2231-8526