Accepted Manuscript

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PII: S1359-8368(16)31443-3

DOI: 10.1016/j.compositesb.2016.11.054

Reference: JCOMB 4747

To appear in: *Composites Part B*

Received Date: 28 July 2016

Revised Date: 7 November 2016

Accepted Date: 22 November 2016

Please cite this article as: Wozniak J, Kostecki M, Cygan T, Buczek M, Olszyna A, Self-lubricating aluminium matrix composites reinforced with 2D crystals, *Composites Part B* (2016), doi: 10.1016/j.compositesb.2016.11.054.

Self-lubricating aluminium matrix composites reinforced with 2D crystals

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Abstract

In this study, AA6061-base composites reinforced with graphene (Gn(12)), hexagonal boron nitride (hBN) and molybdenum disulphide (MoS_2) particles were analyzed. The composites were prepared by powder metallurgy processing using the Spark Plasma Sintering to consolidate powders. Microstructure, physical and wear properties were investigated and compared with unreinforced AA6061. For all composites, high relative density were obtained. The tribological studies showed that the friction coefficient significantly decreased with 2D crystals content increase. The results indicated that abrasive mechanisms have dominated during the wearing of the composites. Moreover, in composites with Gn(12) and MoS_2, a film on the worn surface was observed.

Keywords: A. Metal-matrix composites (MMCs), B. Mechanical properties, B. Wear, E. Sintering

1. Introduction

Aluminium and its alloys are very attractive materials for various industries such as automobile, aerospace or electronic owing to their specific strength and other mechanical properties [1-3]. However, aluminium alloys exhibit low resistance to abrasive wear especially under deficit lubricating conditions. To improve the tribological properties of aluminium alloys, composites reinforced with hard ceramic