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Thermal conductivity and mechanical properties of flake graphite/copper composite with a boron carbide-boron nano-layer on graphite surface

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Abstract

Graphite/copper composites had attracted significant recent attention for thermal management applications due to their superior thermal properties, low cost and ease of machining. However, achieving the enhancement of mechanical properties of composites with high thermal conductivity remained challenging. In this study, graphite/copper composites had been produced by vacuum hot pressing process, in which the boron carbide-boron coating was synthesized on graphite to improve the mechanical properties of copper matrix composites with high volume fraction of graphite. The resulting composites had superior thermal conductivity (676W/mK, 180% of copper) and apposite coefficient of thermal expansion (7.1ppm/K), which was attributed to the homogeneous dispersion and well-controlled alignment of graphite in the composite. And the results showed that the coating on graphite slightly decreased the thermal conductivity and coefficient of thermal expansion of the composites, but evidently improved the bending strength. The flexural strength raised to 74MPa, 42% increased with that of uncoated composite.

Keywords: Metal-matrix composites；Surface treatments；Thermal properties

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1. Introduction

Heat sink elements in multi-functional electronic packaging systems are