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Thermal and electrical properties of SiO_2/SiC-epoxy composite by surface oxidation of silicon carbide

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Abstract

SiO_2/SiC core-shell hybrid was prepared by oxidation of silicon carbide fibers. The material was thermally oxidized to observe the oxidation layer on the surface of the silicon carbide. The electrical and thermal properties of the epoxy composites consisting of SiC or SiO_2/SiC were investigated. The thermal conductivity of SiO_2/SiC-epoxy composites increased with increasing oxidation temperature. The thermal conductivity of the SiO_2/SiC-epoxy composite was higher than that of the SiC-epoxy composite. The surface resistance and breakdown strength of the epoxy composite containing SiO_2/SiC increased after the thermal oxidation of SiC. The developed SiO_2/SiC could be used for electronic packaging applications.

Highlights

- Simple oxidation process produces fibrous SiO_2/SiC filler for epoxy composites
- Thermal conductivity and electrical insulation increased with treatment temperature (SiO_2 thickness)
- Thermal conductivity and electrical insulation of oxidized fiber composite higher than that of SiC-epoxy one
- Increased thermal conductivity due to improved interfacial interactions

Keywords : thermal property, electrical property, silicon carbide, surface oxidation, electronic packaging

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1. Introduction

A major bottleneck in the development of effective electronic packaging is thermal management [1]. Efficient thermal management requires high-performance thermal interface materials that have