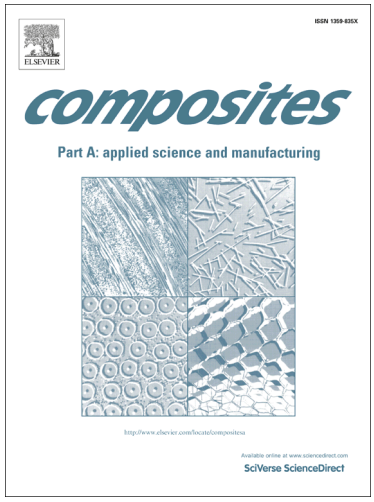

Effect of nanosilica on the microstructure, thermal properties and bending strength of nanosilica modified carbon fiber/phenolic nanocomposite

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Effect of nanosilica on the microstructure, thermal properties and bending strength of nanosilica modified carbon fiber/phenolic nanocomposite

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Abstract

Mechanical, thermal stability and ablation properties of nanosilica (SiO_2) modified carbon fiber/phenolic composites have been investigated. Nano SiO_2 /carbon fiber/phenolic nanocomposites were prepared using chopped carbon fiber, phenolic resin and nano SiO_2 by compression molding. The ablation properties of composites were tested in an oxyacetylene torch. The results show that the linear and mass ablation rates of the composites after modifying with 5 wt% nano SiO_2 decreased by 23.55% and 61.11%, respectively. Microstructure investigations and X-ray diffraction studies reveal that nano SiO_2 reacts with char at high-temperature, forming ablation resistant silicon carbide. Mechanical analysis shows that the bending strength of the nanocomposite increases by about 13% after adding 3 wt% nano SiO_2.

Keywords: A. Carbon fiber, A. Nanocomposite, B. Environmental Degradation-Ablation, B. Thermal stability.

1. Introduction

Carbon fiber reinforced phenol formaldehyde (PF) composites have been widely used not only as structural applications but also as high temperature resistant materials. Specifically, they have been applied to a Thermal Protection System (TPS) for reentry vehicles or rocket engine components due to their excellent ablation resistance. Carbon fibers have been widely used as reinforcement in composites for thermal protection due to their superb dimensional stability at high temperatures, low density, non-flammability and a variety of outstanding physical properties [1].