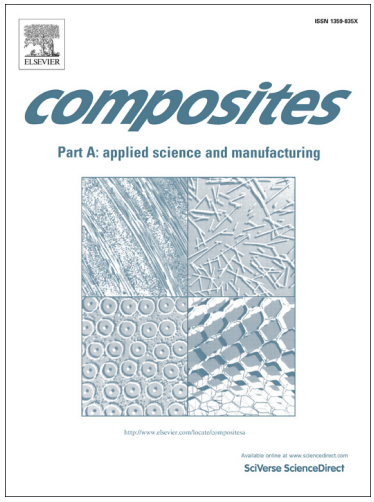

Thermal and mechanical properties of phenolic-based composites reinforced by carbon fibres and multiwall carbon nanotubes

Zahra Eslami, Farshad Yazdani, Mir Aidin Mirzapour

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Thermal and mechanical properties of phenolic-based composites reinforced by carbon fibres and multiwall carbon nanotubes

Zahra Eslami, Farshad Yazdani*, Mir Aidin Mirzapour
Chemistry and Chemical Engineering Research Center of Iran, P.O.Box 14335-186, Tehran, Iran

Abstract

The thermal, mechanical and ablation properties of carbon fibre/phenolic composites filled with multi wall carbon nanotubes (MWCNTs) were investigated. Carbon fibre/phenolic/MWCNTs nanocomposites were prepared using different weight percentage of MWCNTs by compression moulding. The samples were characterized by scanning electron microscopy (SEM), flexural tests, thermal gravimetric analysis and oxyacetylene torch tests. The thermal stability and flexural properties of the nanocomposites increased by increasing MWCNTs content (wt% ≤1), but they decreased when the content of MWCNTs was 2 wt%. The linear and mass ablation rates of the nanocomposites after modified with 1 wt% MWCNTs decreased by about 80% and 52%, respectively. To investigate the material post-test microstructure, a morphological characterization was carried out using SEM. It was shown that the presence of MWCNTs in the composite led to the formation of a strong network char layer without any cracks or opening.

Keywords: A. Polymer-matrix composites (PMCs), B. High-temperature properties, C. Mechanical properties, D. Electron microscopy

1. Introduction

In recent years, carbon fibre/ phenolic composites modified with nanomaterial have attracted great interest in the field of advanced, high-performance materials and structures. Specifically, they are so used in the aerospace applications where most of the ceramic and metallic materials cannot be used [1-4]. Ablative materials protect the space vehicle from the huge amount of heat

*Corresponding author, Tel.: +98 2144580774
E-mail address: fyazdani@ccerci.ac.ir, aidinmirzapour1@gmail.com