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Mechanical and thermal properties of C/C composites modified with SiC nanofiller

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Abstract

The paper deals with carbon/carbon composites (C/C) modified with a ceramic nanofiller designed for high temperature applications. The C/C samples were manufactured from a coal tar pitch precursor (CTP) modified with a silicon carbide in the form of nanopowder (SiC). Carbon fibers were used as a reinforcement. The composite samples containing differing amount of the ceramic nanofiller were manufactured. The mechanical properties, thermal conductivity and oxidation resistance of C/C composites before and after modification with nanoSiC were determined. The structure and microstructure of the composites were examined using X-ray diffraction and SEM with EDS technique. The presence of the ceramic nanoparticles in carbon matrix precursor decreased the total porosity of carbon composites and redistributed pore sizes after annealing to 1000 °C. CTP-derived carbon matrix was composed from two carbon components that differed in crystallographic parameters. Modified C/C composites performed distinctly higher mechanical properties, thermal conductivity and oxidation resistance in comparison with the pure carbon/carbon samples.

Keywords: C/C composites; nanoSiC; mechanical strength; thermal conductivity; oxidation resistance

1. Introduction

Mechanical and thermal properties of C/C composites are strongly affected by the type of their constituents and by the methods and their manufacturing [1]. In case of mechanical properties of C/C composites the interface bond between carbon fiber surface and carbon matrix precursor cannot be too high

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