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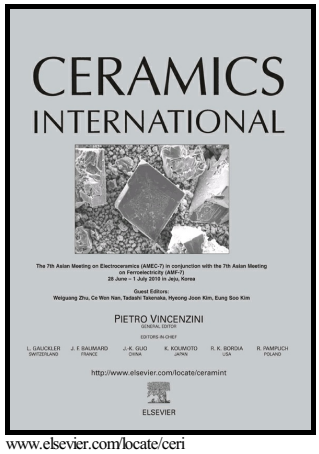

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Oxidation and erosion resistance of multi-layer SiC nanowires reinforced SiC coating prepared by CVD on C/C composites in static and aerodynamic oxidation environments

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Abstract

A multi-layer SiC nanowires reinforced SiC (SiCnws-SiC) coating was prepared in-situ on carbon/carbon (C/C) composites by three chemical vapor deposition (CVD) processes. The microstructure and phase composition of the nanowires fabricated on the first-layer SiCnws-SiC coating and the coatings were examined by SEM, TEM, and XRD. The bamboo-like SiC nanowires with a 50 nm diameter and a length of several tens of micrometers are straight, randomly orientated and distributed like a net on the first-layer SiCnws-SiC coating. The growth direction is [111], and the growth mechanism is VS. The multi-layer SiCnws-SiC coating has three layers: the thickness of the first-layer is roughly 400 μm, and the outer two layers are about 200 μm. Each layer has a sandwich structure. The isothermal oxidation and erosion resistance of the multi-layer SiCnws-SiC coating were investigated in an electrical furnace and a high temperature wind tunnel. The results indicated that the weight loss of the multi-layer SiCnws-SiC coated C/C composites was only 1.8% after oxidation in static air at 1773 K for 361 h. Further, the coated sample failed due to fracture of the coating at the