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Improved fracture toughness of CNTs/SiC composites by HF treatment

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Abstract

Residual oxide impurities in high-temperature structural ceramics containing carbon-based reinforcements can react with the reinforcements during sintering to weaken their toughening effect. To eliminate such effect, a simple HF treatment technique is proposed. In this work, SiC ceramics and carbon nanotubes (CNTs)/SiC ceramic composites were fabricated by spark plasma sintering. The results showed that, after HF treatment, the structure of incorporated CNTs in the composites was unaffected and a slight improvement of relative density was fulfilled. The fracture toughness improvement of the composites from 4.4±0.4 MPa•$m^{1/2}$ to 5.4±0.5 MPa•$m^{1/2}$ with indentation method (IM) after HF treatment was also observed due to crack branching, CNT pull-out and crack bridging.

Keywords: CNTs/SiC; Toughening; Ceramic composite; Interfacial reaction

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