

Manufacturing and mechanical characterization of multiwalled carbon nanotubes/quartz nanocomposite

ABSTRACT

Monolithic refractory ceramic materials have outstanding heat resistant properties at elevated temperature and possess high stiffness but are generally brittle. To toughen a typical matrix of natural traditional monolithic quartz ceramic, functionalized multiwalled carbon nanotubes (FMWNTs) were added to the matrix as filler for the first time and processed by a wet method using conventional powder processing; involving consolidation by pressureless sintering technique, to obtain the novel nanocomposite. The effect of the varied amount of carbon nanotubes (0.01, 0.1, 0.5, 1 & 4 wt.%) on densification and mechanical properties of the composites were studied. 1 wt.% FMWNTs/quartz (QF-1) possesses moderate tensile and compressive strengths, modest Young's modulus and toughness, and high fracture strain in tension. Good combination of strengths and toughness in QF-1 nanocomposite, suggest the possibility of using 1 wt.% FMWNTs as an additive in the preparation of silica/silica-based refractory mixture for optimum mechanical properties.

Keyword: CNTs; Quartz; CNTs-Quartz manufacturing; Nanocomposites; Mechanical characterization.