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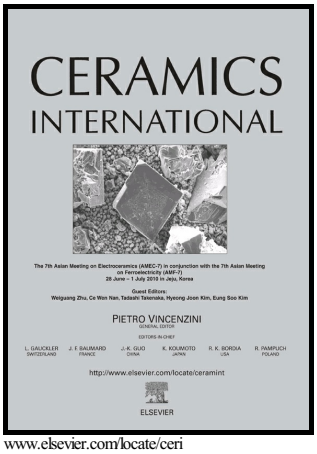

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Growth of silicon carbide nanotubes in arc plasma treated silicon carbide grains and their microstructural characterizations

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Abstract

Silicon carbide nanotubes were found to grow in straight as well as curved configurations by treating silicon carbide grains in an arc plasma reactor/furnace followed by 3 hours of cooling (in air). By increasing the plasma treatment time from 16 min to 20 min, multi-wall tubes were found to change to single wall tubes with reduction in diameter from few nm to sub-nm. Typical *in situ* grown nanotubes were characterized by XRD, TEM, SAED, HRTEM, EDS and micro Raman spectroscopy, and it is established from these evaluations that the nanotubes are made up of silicon carbide and not carbon. A possible mechanism, involving reaction between the plasma dissociated carbon (solid) forming carbon nanotube and the left-out silicon (existing in vapour state) during the cooling period (3000-2680^{0}C), is suggested to be responsible for silicon carbide nanotube formation in the plasma assisted process.

Key words: Silicon carbide nanotubes, Arc plasma, TEM, Raman spectroscopy

1. Introduction

Silicon carbide (SiC) is a wide band gap semiconductor (E_g for α phase: 3.2 eV, for β phase: 2.2 eV) that has drawn active attention of recent workers for its improved functionalization property over carbon (C) due to existence of multiple-bilayer wall structure on surface which allows surface Si atoms to functionalize more readily with molecules [1]. The compound can