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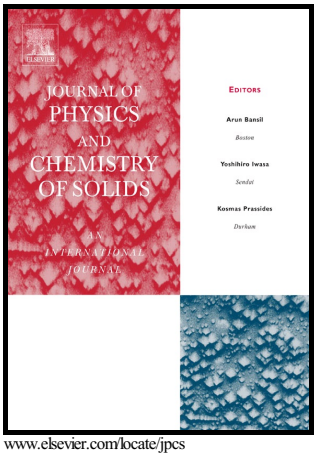

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Pulsed laser ablation synthesis of carbon nanoparticles in vacuum

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Abstract

Crystalline carbon nanoparticles (CNPs) with narrow size distribution were synthesized by pulsed laser ablation (PLA) of graphite in vacuum under a slow flow of argon gas. Transmission electron microscopy (TEM) images indicate the formation of interconnected carbon particles that exhibit a graphitic nanostructure in X-ray powder diffraction (XRD) characterization. Photoluminescence (PL) was observed after acid treatment and surface passivation on synthesized CNPs. PL spectra indicated the existence of narrow size distribution of particles that is confirmed by TEM image, XRD pattern and Raman spectroscopy. Moreover, TEM image, Raman spectra and XRD patterns of surface passivated CNPs show that raw CNPs in an interconnected structure are fragmented into distinct particles that leads to surface to volume ratio increase and photoluminescence enhancement. Fourier transform infrared (FTIR) spectroscopy revealed that in addition to the size confinement, the surface modification of CNPs by carboxylate and methyl groups after surface passivation is also a reason for photoluminescence.

Keywords: Carbon nanoparticle; laser ablation; surface passivation; nanostructure; photoluminescence.

1. Introduction

Recently, carbon nanoparticles (CNPs) have attracted an intense attention for their prominent properties. This new class of carbon-based nanostructures is nontoxic, biocompatible, physicochemically and photochemically stable, high aqueous soluble, and shows strong, size