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# Photoluminescent SiC nanoparticles synthesized by laser ablation in ethanol medium

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Silicon Carbide (SiC) is a semiconductor material, which has been given much attention due to thewide band gap, high hardness, high thermal conductivity, and good chemical stability. Nano-sized SiC particle shows photoluminescent properties due to quantum confinement effects which are not observed in bulk counterpart [1]. Commercially available SiC powders (200-450 mesh) are mixed in ethanol taken in a beaker. The solution shows a greyish coloured solution, which gets easily deposited at the bottom. Laser ablation of the SiC colloidal solution was performed using a Q-Switched Nd:YAG laser system (Quanta-Ray) emitting at 1064 nm, 10 Hz having energy 500 mJ per pulse and 9.5 mm beam diameter in pulsed mode. Schematic of the laser ablation process is shown in Figure 1. A brownish transparent solution was obtained after 15 minutes of laser irradiation and microparticles were deposited at the bottom of the beaker. The transparent solution containing SiC nanoparticles have been taken for further analysis and the solution is found to be more stable. The SEM image shows nanoparticle size is below 60 nm.

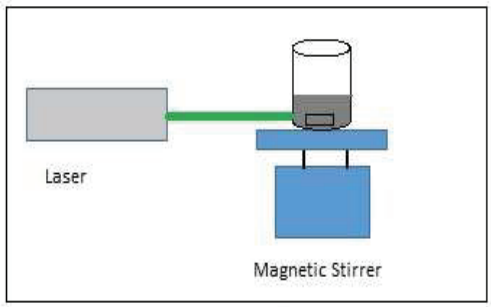


Figure 1: Schematic sketch of the laser ablation of liquid containing SiC powder

As shown in figure 2, photoluminescence (PL) emission spectrum of SiC NPs exhibits emission peaks at 409 nm and 432 nm for an excitation wavelength of 250 nm, which belongs to the violet region of the visible spectrum. The band gap energy of bulk SiC is 2.2 eV [2]. However, the band gap of synthesised SiC nanoparticle from the PL emission is found to be 3.04 eV and 2.87 eV, which is much higher than the bulk material. It may be due to the quantum confinement effects.

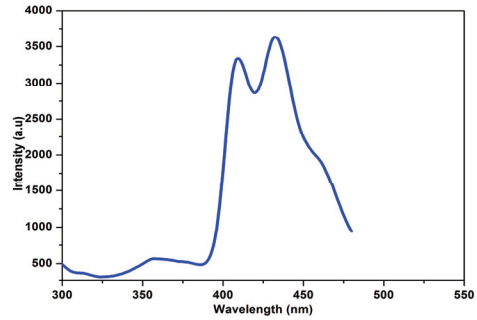


Figure 2: Photoluminescence emission spectra of SiC NPs corresponding to the excitation wavelength of 250 nm

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