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Silver Nanoparticles-Enhanced Luminescence Spectra of Silicon Nanocrystals

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Abstract : Metal-enhanced luminescence of silicon nano crystals (SiNCs) was determined using two different particle sizes of silver nano particles (AgNPs). SiNCs have been characterized by scanning electron microscopy (SEM), high resolution transmission electron microscopy (HRTEM), Fourier transform infrared spectroscopy (FTIR) and X-ray photo electron spectroscopy (XPS). It is found that the SiNCs are crystalline with an average diameter of 65 nm and FCC lattice. AgNPs were synthesized using photochemical reduction of AgNO3 with sodium dodecyl sulphate (SDS). The enhanced luminescence of SiNCs by AgNPs was evaluated by confocal Raman microspectroscopy. Enhancement up to ×9 and ×3 times were observed for SiNCs that mixed with AgNPs which have an average particle size of 100 nm and 30 nm, respectively. Silver NPs-enhanced luminescence of SiNCs occurs as a result of the coupling between the excitation laser light and the plasmon bands of AgNPs; thus this intense field at AgNPs surface couples strongly to SiNCs.

Keywords : silver nanoparticles, surface enhanced raman spectroscopy (SERS), silicon nanocrystals, luminescence
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