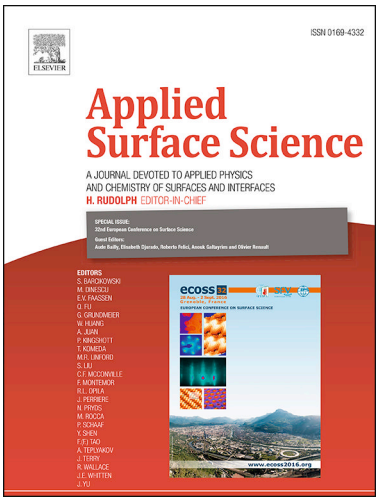

Full Length Article

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Srikanta Karmakar, Subrata Biswas, Pathik Kumbhakar

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A comparison of temperature dependent photoluminescence and photo-catalytic properties of different MoS_2 nanostructures

Srikanta Karmakar, Subrata Biswas, Pathik Kumbhakar*

Nanoscience Laboratory, Dept. of Physics, National Institute of Technology, Durgapur, 713209, West Bengal, India

**Corresponding author: Tel: (+91) 0343-2754777; E-mail: nitdgpkumbhakar@yahoo.com; pathik.kumbhakar@phy.nitdgp.ac.in*

Abstract

Here, a comparison of optical absorption, photoluminescence (PL) emission and catalytic properties of hydrothermally synthesized MoS_2 nanoplatelets (MNPs), a few-layer MoS_2 nanosheets (MNSs), and MoS_2 nanorods (MNRs) have been done, which is rarely available in the literature. The formation of MNSs has been confirmed by transmission electron microscopy, field emission scanning electron microscopy, and Raman spectra analyses. In UV-Vis absorption and PL emission spectra of colloidal aqueous dispersions of the samples, 'A' and 'B' excitonic peaks having energy separation of ~219 meV are clearly observed. The 'D' excitonic band-gap at 0 K of MNSs has been calculated to be 3.21 eV from the temperature-dependent PL emission studies. A thermodynamic approach has been employed to understand the adsorption of methylene blue (MB) dye onto MNPs, MNRs, and MNSs at various temperatures and it is revealed that the adsorption process is spontaneous, endothermic and physisorption in nature. The equilibrium adsorption capacities of the