Synthesis and study of structural and morphological properties of MoS$_2$/Ag$_2$S nanocomposites and investigating its photocatalytic properties

M. Khoshab, P. Iranmanesh*

Faculty of Sciences, Vali-e-Asr University of Rafsanjan, Rafsanjan, Iran.

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**Abstract:** MoS$_2$/Ag$_2$S nanocomposite is synthesized by hydrothermal method without using inert atmosphere from green synthesized Ag nanoparticle. The synthesized samples were characterized and studied by X-Ray Diffraction (XRD), Fourier Transform-Infrared Spectroscopy (FTIR), Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM) analysis. The optical properties of the samples were investigated by using UV-Vis absorption spectra. Also the formation of Ag nanoparticles via Sesbania sesban extract is confirmed by UV-Vis spectra. The hexagonal crystal structure of MoS$_2$ and the monoclinic structure of Ag$_2$S nanoparticles was confirmed by the result of X-ray diffraction pattern. SEM and TEM images showed the morphology and loading Ag$_2$S on MoS$_2$ structures. The photocatalytic activity of nanocomposite against of the methyl orange and methylene blue colors was evaluated by UV light. The results showed that the MoS$_2$/Ag$_2$S nanocomposite is a good destructive dye of methyl orange and to some extent methylene blue with UV light.

**Keywords:** Hydrothermal; nanocomposite; molybdenum disulfide; silver sulfide; photocatalytic activity.