ABSTRACT

Water pollution caused by synthetic dye waste such as methylene blue has become an environmental problem that is difficult to overcome because the compound is resistant to natural degradation. One of the methods currently being developed to address this problem is photocatalytic degradation using semiconductor materials. Cadmium sulfide (CdS) has potential as a photocatalyst due to its ability to absorb visible light with a band gap value of approximately 2.3–2.4 eV. However, CdS has several drawbacks, including rapid electron–hole recombination and susceptibility to photocorrosion. Therefore, in this study, CdS was modified using indium sulfide (In_2S_3) to improve its photocatalytic activity.

CdS thin films were synthesized on silica substrates using the Chemical Bath Deposition (CBD) method with deposition time variations of 5 minutes, 10 minutes, and 15 minutes, followed by modification with an In_2S_3 layer. Material characterization was carried out using XRD, SEM-EDX, UV–Vis DRS, fluorescence spectroscopy, and Linear Sweep Voltammetry (LSV). The photocatalytic activity was evaluated through the degradation of methylene blue under light irradiation.

The results showed that CdS/In_2S_3 thin films were successfully formed on the silica substrate surface. The modification with In_2S_3 caused changes in the Full Width at Half Maximum (FWHM) values, indicating changes in crystallite size. SEM-EDX analysis showed the distribution of CdS and In_2S_3 on the substrate surface, while photocatalytic tests demonstrated an enhancement in methylene blue degradation through the formation of hydroxyl radicals (•OH). The optimum CdS deposition time was obtained at 10 minutes, and methylene blue degradation occurred most effectively under neutral solution conditions.

Keywords: Chemical Bath Deposition, photocatalytic, CdS, In_2S_3, methylene blue.