

ABSTRACT

Cadmium sulfide is an inorganic compound with the formula CdS, in the form of a yellow solid that is insoluble in water. Some applications of cadmium sulfide (CdS) are used as photoanodes in water splitting, photo fuel cells, layers in solar cells and for the degradation of dyestuffs. Synthetic dyes such as methylene blue (MB) are basic dyes that are very important in the process of dyeing leather, cotton fabrics, tannins and are relatively inexpensive compared to other dyes. Therefore, in this study, cadmium sulfide synthesis was carried out using electrodeposition and sulfurization methods for photoelectrochemical destruction of dyestuffs.

This research consists of 4 stages: The 1st stage includes the electrodeposition of cadmium (Cd) on a Fluorine-doped tin oxide (FTO) thin glass substrate. The 2nd stage is the sulfurization process with a variety of sulfurization sources (sulfur, thiourea and hydrogen sulfide) in the furnace so that CdS is obtained. Stage 3 is characterization and testing with X-ray Diffraction (XRD), Scanning Electron Microscope-Energy Dispersive X-Ray (SEM-EDX), Diffuse Reflectance Spectroscopy UV-Visible (DRS UV-Vis), Raman, XPS and Linear Sweep Voltammetry (LSV). The 4th stage of the sample was used for the degradation process of blue methylene dye using NaOH electrolyte.

The results showed that the sample was blackish after the Cd electrodeposition process on FTO thin glass. CdS photocurrent measurements at 0.8 V voltage for sulfur, thiourea and hydrogen sulfide were 1.57, 0.44 and 0.99 mA/cm². The diffractogram shows the presence of CdS with an average crystal size of 11.27 and 13.20nm respectively for CdS with sulfur and thiourea sources while for hydrogen sulfide is amorphous. The results of characterization with SEM showed that the CdS particle size was 3.5, 4.4 and 3.7 μ m respectively for CdS with sulfur, thiourea and hydrogen sulfide sources. The band gap energies were analyzed as 1.94, 2.12 and 2.11 eV respectively for CdS with sulfur, thiourea and hydrogen sulfide sources. The ability of CdS to degrade blue methylene dye with NaOH electrolyte in sulfur samples was found to have a degradation % of 52.21, thiourea 28.17 and H₂S up to 40.79%.

Keywords: Cadmium Sulfide, Fluorine-doped tin oxide, electrodeposition, sulphurification, methylene blue.