ABSTRACT

The increasing activity of the agricultural industry has led to the release of pollutants in the form of toxic chemicals, one of which is 2,4,6-trichlorophenol. Photocatalysis offers an effective solution by breaking down such pollutants into safer compounds. $MoS_2/Zn_xCd_{1-x}S$, with MoS_2 as a co-catalyst, is considered an efficient material for photocatalytic applications. This study synthesized $MoS_2/Zn_xCd_{1-x}S$ composites with variations of x = 1; 0.75; 0.5; 0.25; and 0 using a two-step hydrothermal method. Material characterization was carried out using XRD (X-Ray Diffraction), SEM-EDX (Scanning Electron Microscopy-Energy Dispersive X-Ray Spectroscopy), SAA (Surface Area Analyzer), and UV-DRS (Ultraviolet-Diffuse Reflectance Spectroscopy). Photodegradation tests were conducted on 2,4,6-trichlorophenol under UV light. The results showed that increasing the Cd content decreased crystallinity and enhanced visible light absorption. The MoS_2/Zn_1Cd_0S variation exhibited the highest degradation efficiency of 81.81%, with a reaction rate following pseudo-second-order kinetics. In the long-term stability test, the $MoS_2/Zn_{0,5}Cd_{0,5}S$ variation showed the best durability over six repeated cycles. These findings confirm that optimizing the Zn:Cd ratio significantly affects the efficiency and long-term stability of the photocatalyst material.

Keywords: $MoS_2/Zn_xCd_{1-x}S$, 2,4,6-trichlorophenol, photocatalyst, photodegradation.