

***PHOTOELECTROCATALYSIS OF METHYL ORANGE DYE
DEGRADATION FROM BIVO₄ SYNTHESIS USING THE SPIN-COATING
METHOD***

ABSTRACT

Water pollution due to toxic and difficult to degrade methyl orange (MO) causes negative impacts on the environment. Semiconductor-based photoelectrocatalyst method is a solution to reduce the problem of dye waste accumulation. Bismuth vanadate (BiVO₄) is used as a semiconductor because it has a bandgap of around 2.3-2.4 eV. This study synthesized BiVO₄ thin films on FTO with variations of 6; 12; 18; 24; 30 layers at a temperature of 500°C. Photocurrent density measurements were carried out to determine the most optimal thin film variation. Characterization was carried out using XRD, SEM-EDX, UV-DRS, and fluorescence. The highest photocurrent density value of 0.073 mA/cm² was shown in a 6-layer BiVO₄ thin film. Bi, V, and O are the constituent elements of the BiVO₄ photocatalyst. The low electron-hole recombination rate indicates that the charge separation efficiency is better. Photodegradation tests showed that the six-layer BiVO₄ efficiently degraded methyl orange up to 66.67% in 60 minutes, following second-order reaction kinetics. The combination of a low bandgap of 2.097 eV, a favorable crystal structure, and morphology demonstrated that the BiVO₄ thin film effectively degraded methyl orange under visible light.

Keywords: BiVO₄, spin-coating, photocatalyst, degradation.