

Electrochemical Generation of Zn_2SnO_4 Photocatalyst for Degradation of Methylene Blue

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ABSTRACT

In this paper, a simple two-step hybrid electrochemical-thermal route was developed for the synthesis of cubic shaped Zn_2SnO_4 (ZTO) nanoparticles using aqueous sodium bicarbonate ($NaHCO_3$) and sodium stannate (Na_2SnO_3) as an electrolyte. The sacrificial Zinc metal was used as both anode and cathode in an undivided cell under galvanostatic mode at room temperature. The bath concentration and current density were respectively varied from 30 to 120 mmol and 0.05 to 1.5 A/dm². The electrochemically generated precursor was calcined for an hour at different range of temperatures from 60 to 500°C. The crystallite sizes in the range of 24-53 nm were calculated based on the Debye-Scherrer equation. Scanning electron microscopy results reveal that all the particles have cubic morphology with a diameter of 40-50 nm. The as-prepared ZTO nanoparticles showed higher catalytic activity towards the degradation of methylene blue (MB) dye, and the 90% degradation was found for the sample calcined at 500 °C, which is greater than that of commercial TiO_2 -P25 photocatalysts. These results indicate that the ZTO nanoparticles may be employed to remove dyes from waste water.

Keywords: Photocatalyst; Cubic; Methylene Blue; Electrochemical; Nanoparticle; Zn_2SnO_4 .

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