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Influence of Annealing Temperature on Photocatalytic and Electrochemical Sensing Properties of SnO_2/ZnO Nanocomposites

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SnO_2/ZnO nanocomposites were prepared by sol-gel technique in the presence of polyethylene glycol, followed by annealing at various temperatures ranging from 600 to 1000 °C. The prepared SnO_2/ZnO were studied by XRD, FTIR, FT-Raman,TEM, UV–vis DR spectroscopy, photoluminescence spectroscopy, and nitrogen adsorption-desorption isotherm analysis. The crystal phases and energy gap of the SnO_2/ZnO nanocomposites were modified with annealing temperatures. The photocatalytic activity of the prepared SnO_2/ZnO nanocomposites for the decomposition of methylene blue (MB) dye was examined under visible light illumination. It was found that photodegradation rate of the prepared photocatalysts for the decomposition of MB decreased linearly upon increasing the annealing temperature from 600 to 1000 °C. The maximum photocatalytic efficiency (100%) was obtained for the SnO_2/ZnO nanocomposite annealed at 600 ^oC. The photocatalytic activity of the SnO_2/ZnO nanocomposite was dependent on their surface areas and bandgap values. The optimal SnO_2/ZnO nanocomposite annealed at 600 ^oC was also used for the electrochemical sensing of liquid ethanol showing significant sensing response with a high sensitivity of 20.09 $\mu AmM^{-1}cm^{-2}$ and a limit of detection of 25.2 µM ethanol concentration.

Keywords: SnO_2/ZnO; Nanocomposites; Sol-gel; Photocatalyst; Photodegradation

FULL TEXT