Synthesis and Characterization of highly efficient ZnO-Sm_2O_3 Photocatalyst for the photocatalytic degradation of bentazon herbicide

Sadaf Yasmeen[a]*, Luca Burratti[b], Leonardo Duranti[c], Emanuela Sgreccia[a], Paolo Prosposito

[a] Industrial Engineering Department, University of Rome Tor Vergata, Via del Politecnico 1, Rome, 00133, Italy.

[b] Faculty of Science, Technology and Innovation of the University "Mercatorum", Piazza Mattei 10, Rome, 00186, Italy

[c] Department of Chemical Science and Technologies, University of Rome Tor Vergata, Via Della Ricerca Scientifica 1, Rome, 00133, Italy

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Abstract: In this work, pristine zinc oxide (ZnO), samarium oxide (Sm_2O_3) and ZnO-Sm_2O_3 nanocomposite were synthesized by co-precipitation technique. To investigate the physicochemical properties of prepared samples, X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FTIR) and UV-vis spectroscopy (UV) were employed. XRD confirms the formation of nanocomposite consisting of ZnO (hexagonal) and Sm_2O_3 (cubic) structure. The smaller optical energy band gap of ZnO-Sm_2O_3 (2.37 eV) as compared to the individual oxides shows that it has light absorption range from UV to natural light. FTIR results confirm the formation of samples via presence of oxygen-metal bonds. ZnO-Sm_2O_3 nanocomposite shows outstanding photocatalytic performance against bentazon and achieved 90% degradation efficiency under UV light source in 140 minutes. The order of degradation efficiency against bentazon of the prepared samples was ZnO-Sm_2O_3>ZnO>Sm_2O_3 respectively. The effect of different operational parameters on the photocatalytic performance of ZnO-Sm_2O_3 including catalyst loading, bentazon concentration and pH effect along with reusability experiment was also studied. ZnO-Sm_2O_3 nanocomposite was found to be a potential candidate for wastewater treatment.

Sadaf Yasmeen

Industrial Engineering Department, University of Rome Tor Vergata, Via del Politecnico 1, Rome, 00133, Italy.

Sadaf.yasmeen@students.uniroma2.eu

+393479157004

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