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Synthesis, Characterization and Environmental Application of Ag-Ag 3 PO 4 Photocatalyst

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The accidental release of crude oil and water-soluble dyes into our marine environment is a major concern of the environmental protection agency of most countries worldwide. Different materials are therefore being developed and investigated for their potential application in remediating these pollutants. Semiconductor based photocatalysts have been examined for their potential in solving many environmental and energy problems. Developing highly efficient visible light active photocatalyst which can be used in environmental remediation has therefore become the focus of most researchers. A highly efficient Ag-Ag 3 PO 4 photocatalyst was synthesized by a modified precipitation method. The as-synthesized Ag-Ag 3 PO 4 was characterized with X-ray diffraction (XRD), scanning electron microscopy (SEM), energy dispersive spectroscopy (EDS), Raman spectroscopy, and X-ray photoelectron spectroscopy (XPS). The Ag-Ag 3 PO 4 photocatalyst showed an increase of over 300 % in rate of photocatalytic degradation of rhodamine blue dye when compared to Ag 3 PO 4 under visible light illumination. Heat treatment of the as synthesized Ag-Ag 3 PO 4 almost doubled its pseudo first order rate constant for the degradation of rhodamine blue dye. The synthesized photocatalyst was stable after cycles of photocatalytic degradation of rhodamine blue dye. The potential application of the Ag-Ag 3 PO 4 in oil spill remediation was examined through photocatalytic degradation of asphaltene, aromatic and paraffin components in crude oil. UV-vis, FTIR and GC-MS analysis of the oil components after visible light irradiation showed excellent degradation with the formation of intermediate photoproducts. The photocatalytic activity enhancement of the Ag-Ag 3 PO 4 can be attributed to the good electron trapping role of Ag nanoparticles deposited on the surface of the Ag 3 PO 4 . Th results from the study showed the potential application of Ag-Ag 3 PO 4 photocatalyst in environmental remediation.

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