SYNTHESIS OF PALLADIUM DOPED TIN OXIDE VIA HYDROTHERMAL METHOD AND THEIR PHOTOCATALYTIC PERFORMANCE ON MICROPLASTIC REMOVAL

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ABSTRACT

Microplastics pollution has become a global issue with an estimated of 8 million tonnes of plastic garbage have been found in the ocean each year. An enormous number of researches has been carried out by scientists to overcome this issue. Among them, photodegradation is considered as an efficient method to prevent the MPs escape from the wastewater treatment plant into ocean. In this study, SnO_2 with precious metal dopant, Palladium (Pd) is tested as photocatalyst to degrade the polypropylene (PP). Pd was selected due to their high oxidation catalytic characteristics. The Pd doped SnO_2 nanorods are synthesized using a facile hydrothermal route at 180 ˚C for 24 hours. The photocatalytic reaction was executed at different durations (24, 48 and 72 hours) and pH condition, (pH 5, pH 7 and pH 9) under visible light (18W). The as-synthesized photocatalyst undoped SnO_2 and 10% Pd doped SnO_2 nanorods were analysed using X-ray diffraction (XRD), Scanning Electron Microscope (SEM), Fourier Transform Infrared (FTIR) spectrometer and UV-Vis spectrometer. The broadening of XRD peaks in 10% Pd: SnO_2 was signifying a decrease in crystalline size and reduction in crystallinity. SEM images show the nanorods size is decreased when Pd dopant was added into the SnO_2 sample. The performance of the photodegradation of the PP was verified by using FTIR analysis. The presence of strong vibration peaks of the carbonyl band and the hydroxyl band formed confirmed the polymer chain breakdown via photo-oxidation reaction. Optimum time duration and pH condition has shown as important parameters in the degradation of microplastics. Cracks and cavities have been found on the surface of PP which treated with undoped SnO_2 photocatalyst. From the discussion, 10% Pd: SnO_2 has showed its high performance after 72 hours of photocatalytic reaction at pH 9 and it has potential as photocatalyst for degradation of microplastics.