COMPARISON STUDY ON IMMOBILIZATION OF Ag DOPED TiO_2 USING NORMAL AND REVERSE METHODS FOR PHOTODEGRADATION OF METHYLENE BLUE DYE

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ABSTARCT

COMPARISON STUDY ON IMMOBILIZATION OF Ag DOPED TiO_2 USING NORMAL AND REVERSE METHODS FOR PHOTODEGRADATION OF METHYLENE BLUE DYE

This study aims to prepare immobilized Ag/TiO_2 using a reverse (R) method, employing epoxidized natural rubber (ENR-50) and polyvinyl chloride (PVC) as polymer binders to form ATEP(R) plate in order to address solvent interference issue. The immobilization of TiO_2 was performed prior to the photodeposition of Ag (50, 100 and 400 ppm) under a 250-Watt metal halide lamp irradiation for 90 minutes. In this method, TiO_2 was coated onto glass plates using a dip-coating technique. MB was employed as a model pollutant to evaluate the photocatalytic activity of the prepared immobilized Ag/TiO_2. Several instruments were used for the characterization study, including UV-Vis DRS, FTIR and PEC. The UV-Vis DRS results indicated that the band gap of 100-ATEP(R) was 2.42 eV with its absorption edge shifting towards the visible region. 100-ATEP(R) FTIR analysis showed a peak at 1382 cm^{-1}, confirming the successful doping of Ag onto TiO_2 while the less intense peak of OH at 3400 cm^{-1} indicated lower hydrophilic behavior of the photocatalyst. PEC analysis revealed that 100-ATEP(R) exhibited higher current density in LSV curves, lower charge transfer resistance in Nyquist plot and higher photocurrent response in CA plots compared to TEP(R). All immobilized ATEP(R) samples showed excellent photocatalytic degradation of MB dye, achieving over 50% decolorization within 1 hour light irradiation, indicating higher photocatalytic activity compared to the normal method. The photocatalytic degradation of all samples followed the pseudo-first-order reaction model of Langmuir Hinshelwood, with R^2 values above 0.90.

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