STUDY ON PHOTOCATALYTIC PERFORMANCE VIA DIFFERENT APPROACHES ON Pt MODIFIED TiO_2/g-C_3N_4 FOR PHOTODEGRADATION OF RR4 DYE

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ABSTRACT

STUDY ON PHOTOCATALYTIC PERFORMANCE VIA DIFFERENT APPROACHES ON Pt MODIFIED TIO2/g-C3N4 FOR PHOTODEGRADATION OF RR4 DYE

Water pollution, defined as the contamination of water sources by toxic substances, poses a significant threat to human health and aquatic life. Conventional methods have been used to degrade dyes in wastewater, such as ion-exchange, membrane filtration, chemical treatment, and adsorption. However, these methods are not effective to completely degrade dyes and may generate harmful by product. Photocatalysis provides a promising solution to this problem. This study investigates the effectiveness of TiO_2/g-C_3N_4/Pt composites for photocatalytic dye degradation in wastewater. First and foremost, TiO_2/g-C_3N_4 composite was prepared by dry and wet method at different ratios. Both methods involve mixing and calcination of P25 and g-C_3N_4 at 550^oC for 2 h (heating rate of 5^oC/min) in tube furnace. Then, to fabricate TiO_2/g-C_3N_4/Pt, Platinum was deposited onto the TiO_2/g-C_3N_4 wet composite using the photo deposition technique. RR4 dyes were used as model pollutant to examine photocatalytic activity of TiO_2/g-C_3N_4/Pt. XRD, FTIR, UV vis and PEC were used for photodegradation study. XRD analysis shows characteristic peaks at 13.2° and 27.3° for g-C_3N_4. In FTIR, it was observed that functional groups presence in TiO_2/g-C_3N_4/Pt (TC-Pt) were NH_2 and OH around 3300 cm^{-1} to 3700 cm^{-1}, C-N at 1650 cm^{-1}, C=N at 1200 cm^{-1} and triazine ring at 801 cm^{-1}. Based on UV-Vis Analysis, TC-Pt shows more absorption edge toward visible light, indicative reduced band gap from 2.80 eV to 1.6 eV. While for PEC analysis, LSV, EIS and CA demonstrated that TC-Pt has high current density under light, low charge transfer resistance under light and high photocurrent response, respectively. For photocatalytic degradation, all modified samples degraded over 80% of RR4 dye within 1 h of light irradiation. Among the samples, TC-Pt with 1.5% Pt loading had the highest degradation reaction rate constant with a value of 0.0708min^{-1}.

TABLE OF CONTENTS