MODIFICATION AND CHARACTERIZATION OF HETEROJUNCTION $SrTiO_3$/g-C_3N_4 FOR PHOTODEGRADATION OF REACTIVE RED 4 DYES

ATHIRAH AINIYAH BINTI AZMAN

BACHELOR OF SCIENCE (Hons.) CHEMISTRY WITH MANAGEMENT
FACULTY OF APPLIED SCIENCES
UNIVERSITI TEKNOLOGI MARA

FEBRUARY 2024

MODIFICATION AND CHARACTERIZATION OF HETEROJUNCTION $SrTiO_3$/g-C_3N_4 FOR PHOTODEGRADATION OF REACTIVE RED 4 DYES

ATHIRAH AINIYAH BINTI AZMAN

Final Year Project Report Submitted in
Partial Fulfilment of the Requirements for the
Degree of Bachelor of Science (Hons.) Chemistry with Management
in the Faculty of Applied Sciences
Universiti Teknologi MARA

FEBRUARY 2024

This Final Year Project Report entitled "Modification and Characterization of Heterojunction $SrTiO_3$/g-C_3N_4 for Photodegradation of Reactive Red 4 Dyes" was submitted by Athirah Ainiyah Binti Azman in partial fulfilment of the requirements for the Degree of Bachelor of Science (Hons.) Chemistry with Management, in the Faculty of Applied Sciences, and was approved by

_____

Prof. Dr. Mohd Azlan Bin Mohd Ishak
Supervisor
B. Sc. (Hons.) Applied Chemistry
Universiti Teknologi MARA
02600 Arau
Perlis

_____

Assoc. Prof. Dr. Wan Izhan Nawawi Bin Wan Ismail
Co-supervisor
Universiti Teknologi MARA
02600 Arau
Perlis

_____

Dr. Siti Nurlia Binti Ali
Project Coordinator
B. Sc. (Hons.) Applied Chemistry
Faculty of Applied Sciences
Universiti Teknologi MARA
02600 Arau
Perlis

_____

Dr. Nur Nasulhah Binti Kasim
Head of Programme
B.Sc. (Hons) Applied Chemistry
Faculty of Applied Sciences
Universiti Teknologi MARA
02600 Arau
Perlis

Date: _____

TABLE OF CONTENTS

ABSTRACT

MODIFICATION AND CHARACTERIZATION OF HETEROJUNCTION $SrTiO_3$/g-C_3N_4 FOR PHOTODEGRADATION OF REACTIVE RED 4 DYES

A heterojunction $SrTiO_3$/g-C_3N_4 photocatalyst with different mass ratios was prepared by using calcination synthesis. In this process, two conditions were used which are dry and wet methods. RR4 dye was used as a model pollutant to measure the photocatalytic activity of prepared $SrTiO_3$/g-C_3N_4 at various ratios. Fourier Transform Infrared spectroscopy (FTIR) and Ultraviolet-Visible diffuse reflectance spectra (UV-Vis/DRS) were used for the characterization study. In FTIR, Sr–O and Ti–O bonds were observed at 858 and 596 cm^{-1} respectively. The -OH peak for $SrTiO_3$ was observed at 1637 cm^{-1}. Ti-OH peak was observed at around 3443–3447 cm^{-1}. The vibration observed at 805 cm^{-1} indicates the s-triazine ring, and the strong peak observed at 1200-1700 cm^{-1} indicates the g-C_3N_4 hetero ring stretching vibration. In UV-Vis/DRS, the absorption edge of pure $SrTiO_3$ was about 380 nm and the absorption edge of g-C_3N_4 was about 457 nm. The absorption edge of the 10:90 $SrTiO_3$/g-C_3N_4 presents a bathochromic shift. The bandgap energy for raw g-C_3N_4, $SrTiO_3$, and 10:90 $SrTiO_3$/g-C_3N_4 was approximately 2.7, 3.2, and 2.75 eV, estimated using $E = hc/\lambda$ ($hc = 1240$). The redshift bandgap energy shifting of the 10:90 $SrTiO_3$/g-C_3N_4 sample is caused by a substantial chemical interaction between $SrTiO_3$ and g-C_3N_4, which results in a heterojunction effect for visible light absorption. For photocatalytic degradation, all $SrTiO_3$, g-C_3N_4 and prepared $SrTiO_3$/g-C_3N_4 samples have shown photocatalytic degradation under RR4 dye with more than 42% decolourization in 1 h of light irradiation. The modified photocatalyst with mass ratio 10:90 $SrTiO_3$/g-C_3N_4 under dry method show higher photocatalytic activity as compared to pure $SrTiO_3$ and g-C_3N_4. Ethanol solvent used in wet method was not suitable media used for $SrTiO_3$ and g-C_3N_4 in creating the $SrTiO_3$/g-C_3N_4 heterostructure.