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**FINAL YEAR PROJECT 2 – RESEARCH PROJECT**

**PREPARATION AND CHARACTERIZATION OF Ag-TiO<sub>2</sub>/g-C<sub>3</sub>N<sub>4</sub> AND ITS  
APPLICATION UNDER METHYLENE BLUE AND REACTIVE RED 4 DYE**

Name : NUR ARDINI BINTI AHMAD SHAHRUL AMIN  
Student ID : 2023387785  
Program : AS245  
Course code : FSG 671  
Mobile Phone :  
E-mail : 2023387785@student.uitm.edu.my

**Approval by Main Supervisor:**

I certify that the work conducted by the above student is completed and approved this research proposal report to be summited for evaluation. The similarity index is less than 4 %

Supervisor's name : PROFESOR MADYA DR. WAN IZHAN NAWAWI BIN  
WAN ISMAIL

Signature :

Date : 8<sup>th</sup> July 2025

**PREPARATION AND CHARACTERIZATION OF Ag-TiO<sub>2</sub>/g-C<sub>3</sub>N<sub>4</sub> AND  
ITS APPLICATION UNDER VARIOUS DYE**

**NUR ARDINI BINTI AHMAD SHAHRUL AMIN**

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## ABSTRACT

### **PREPARATION AND CHARACTERIZATION OF Ag-TiO<sub>2</sub>/g-C<sub>3</sub>N<sub>4</sub> AND ITS APPLICATION UNDER METHYLENE BLUE AND REACTIVE RED 4 DYE**

The photodegradation process with a photocatalyst is a novel green technology for responding to the remediation of dye-contaminated wastewater. Conventional photocatalysts like TiO<sub>2</sub> are limited by their large band gap and weak responsiveness to visible light, greatly reducing their effectiveness in environmental applications. This study aims to overcome these limitations with the design of a new Ag-TiO<sub>2</sub>/g-C<sub>3</sub>N<sub>4</sub> photocatalyst combining the merits of graphitic carbon nitride (g-C<sub>3</sub>N<sub>4</sub>) and silver (Ag) to improve the absorption of visible light, promote charge separation, and increase photocatalytic efficiency by using a Z-scheme heterojunction and the localized surface plasmon resonance (LSPR) effect. The study investigates the synergistic effects of these improvements, compares the photocatalytic degradation of cationic (Methylene Blue) and anionic (Reactive Red 4) dyes, and determines the recyclability and stability of the composite material. Synthesis of the Ag-TiO<sub>2</sub>/g-C<sub>3</sub>N<sub>4</sub> photocatalyst was performed using chemical reduction accompanied by in-situ calcination procedures, followed by characterization through FTIR, XRD, and UV-Vis DRS. Photodegradation experiments were performed under fluorescent lighting with consideration of dye concentrations and varying pH levels. The results showed significantly enhanced photocatalytic activity, with the photocatalyst exhibiting higher efficiency toward Reactive Red 4, especially under acidic pH, compared to Methylene Blue, which showed moderate degradation under alkaline conditions. Reusability tests indicated that the catalyst maintained its performance over multiple cycles without noticeable decline in activity. In summary, the Ag-TiO<sub>2</sub>/g-C<sub>3</sub>N<sub>4</sub> photocatalyst effectively overcomes the drawbacks of pure TiO<sub>2</sub> and demonstrates excellent degradation performance, particularly for Reactive Red 4, along with recyclability, making it a highly promising solution for sustainable wastewater remediation in alignment with Sustainable Development Goal #6 (Clean Water and Sanitation).

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