

**A COMPARISON STUDY BETWEEN PHOTOCATALYSIS &
PHOTOELECTROCHEMICAL PROCESS IN DEGRADING REACTIVE
RED 4 DYE**

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**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
University Teknologi MARA**

FEBRUARY 2023

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Date: 13th February 2023

ABSTRACT

A COMPARISON STUDY BETWEEN PHOTOCATALYSIS & PHOTOELECTROCHEMICAL PROCESS IN DEGRADING REACTIVE RED 4 DYE

Wastewater releases from the industry contribute to a major environmental issues. Several studies have reported that advanced oxidation process such as photocatalysis degradation (PCD) and photoelectrochemical degradation (PECD) have huge potential to reduce the problem by degrading dyes. Yet, the comparison of those techniques to determine the most suitable wastewater treatment method was very limited. In this study, a comparison of those techniques was observed under degradation of reactive red 4 (RR4), methylene blue (MB) and methyl orange (MO) dyes. TiO₂/ENR/PVC selected as the photocatalyst prepared by the dip-coating method. PCD and PECD process with TiO₂/ENR/PVC for degradation of RR4, MB, and MO were carried out. Several characterizations such as scanning electron microscope (SEM), X-ray diffraction (XRD), Fourier Transform Infrared (FTIR) analysis, and Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) analysis were conducted to support the results. Results indicated that PECD was able to efficiently degrade the RR4 and other dyes compare to PCD due to its ability to increase the electron-hole separation to increase the photocatalytic activities through external voltage. PECD of RR4 have the highest degradation rate (k-value) with 0.2215 min⁻¹ while PCD was *ca.* 0.0036 min⁻¹. The MB and MO were also showing different behavior during PCD and PECD due to their different ionic charges where the degradation rate for PECD and PCD of MB were 0.3513 and 0.0075 min⁻¹ respectively. Same goes to MO with the k-value of 0.0989 and 0.0065 min⁻¹ for PECD and PCD respectively. MB as cationic dye was efficiently degraded under every process due to its higher potential to adsorp on the surface of photocatalyst. However, due to MB ability to react with the metal electrode, PECD of MB produce higher concentration of metal electrode due to its dissolution into dye solution. The result from this study can be used for further studies to obtain the best method that will be employed in wastewater treatment.

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