# UNIVERSITI TEKNOLOGI MARA

# EVALUATION OF PHOTOCATALYSIS AS PRE-TREATMENT METHOD FOR RUBBER GLOVE WASTEWATER RECLAMATION SYSTEM.

**SUHADA BINTI SUAID**

Thesis submitted in partial fulfillment
of the requirements for the degree of
**Bachelor of Engineering (Hons.) Chemical**

**Faculty of Chemical Engineering**

**July 2019**

# ABSTRACT

The aims of this study were to characterize the rubber glove wastewater and investigate the use of $TiO_2$ as photocatalyst for pre-treatment of rubber glove wastewater reclamation system. Three parameters, i.e.; $TiO_2$ loading, pH and light sources were varied to evaluate the performance of photocatalyst for chemical oxygen demand (COD) removal in rubber glove wastewater. The photo-degradation experiment was carried out for the duration of 45 minutes inside a dark box that have been illuminated with aluminium foil and irradiated with UV light. The rubber glove wastewater showed high strength of wastewater which contained major pollutants with high total dissolved solid (TDS) and COD, in the range of 1154-6020 mg/L and 1018-1636 mg/L, respectively. The optimum $TiO_2$ loading in treating rubber glove wastewater was at 0.2 g/L with maximum removal of COD at 44.65%. Within the range of pH tested (pH 4-pH 9), the highest COD removal was observed at pH 7 (neutral). Photo-degradation process under UV light irradiation showed greater COD removal at 44.65% compared to 17.7% under solar irradiation. Thus, in this study, pre-treatment of rubber glove wastewater using $TiO_2$ as photocatalyst shows promising result in terms of COD removal for rubber glove wastewater

# ACKNOWLEDGEMENT

Firstly, I wish to thank God for giving me the opportunity to embark on my degree and for completing this long and challenging journey successfully. My gratitude and thanks go to my supervisor Dr. Lim Ying Pei for her aspiring guidance, invaluably constructive criticism and friendly during my research project.

My appreciation goes to all Faculty of Chemical Engineering members who provided the facilities and assistance during experiment. Special thanks to my colleagues and friends for helping me with this project.

Finally, I take this opportunity to grateful to my father, Suaid bin Saad, my mother, and my sisters, Suraya binti Suaid for the continuous blessing, encouragement, support and attention. I also place on record, my sense of gratitude to one and all, who directly or indirectly, have lend their hand in completing this research. Alhamdulillah.

Suhada Suaid

## Table of Contents

# CHAPTER 1

# INTRODUCTION

## 1.1 Research Background

Nowadays, rubber industry is economically and important towards the country. Some of manufacturing made from rubber are balloons, tyres, glove and others. Thus, the production of rubber products consume a large quantity of water during its operation (Ramanan & Vijayan, 2016) In average, 20 tonnes of rubber and 410 thousand litres of effluent per day was produced by the rubber factory in Malaysia (Mohammadi et al., 2013) In addition, the environmental pollution has been reported due to the discharged of untreated rubber waste water in about 80 million litres daily (Mohammadi et al., 2013). It was reported that 1 tonne of natural rubber concentrated latex produces $18m^3$ of waste water and this effluent contains pollutants which is high in suspended solid, organic matters and nitrogen (Hien & Thao, 2012)

The large amount of effluents produced come from the activities such as cleaning of tank, the uncoagulated latex and serum that retained during the operation (Ramanan & Vijayan, 2016). It is well known that difference waste water will have difference characteristics due to its different raw latex and processing (Wanlaso, 2012). The discharge of these effluents to the environment without a proper treatment may lead to a serious effect towards the ecological balance.

In Malaysia, the most common approached used in the treatment of rubber glove waste-water is biological processes such as pond technology, aerobic and anaerobic methods (Mohammadi et al., 2013) even though this process have been developed and can achieve a promising results, however this process still not efficient enough and might not meet the requirement stated in Environmental Act 1974. Therefore, efficient