

**REMOVAL OF Cr AND Zn USING AgNP<sub>s</sub> / TiO<sub>2</sub>  
NANOCATALYST**

**ABDUL MUHAIMIN BIN ABD JALIL**

**BACHELOR OF CHEMICAL ENGINEERING  
(ENVIRONMENT) WITH HONOURS**

**UNIVERSITI TEKNOLOGI MARA**

**2020**

## **AUTHOR'S DECLARATION**

I declare that the work in the thesis was carried out in accordance with the regulation of Universiti Teknologi MARA. It is original and is the results of my own, unless otherwise indicated or acknowledge as reference work.

I, hereby acknowledge that I have been supplied with the Academic Rules and Regulations, Universiti Teknologi MARA, regulating the conduct of my study and research.

Signed : .....

Date : .....

**Abdul Muhaimin Bin Abd Jalil**

Student ID : 2016691836

## COORDINATOR'S CERTIFICATION

Accepted:



Signed : .....

Date : .....

FYP Coordinator  
**Dr Norain Binti Isa**  
Faculty of Chemical Engineering  
Universiti Teknologi MARA  
Cawangan Pulau Pinang  
13500 Permatang Pauh  
Pulau Pinang

## **ACKNOWLEDGEMENT**

Firstly, I would like to express my sincere gratitude and thank to my supervisor Dr Norain Binti Isa for her support, encouragement, help and teach during the duration of the thesis preparation until its completion.

Apart from that, I would like to thank my parent and all of my family members for their support and encouragement from the beginning of starting the thesis preparation until the end of the thesis preparation.

Furthermore, I would like to thank to the all the lecturers and staffs of Faculty of Chemical Engineering Universiti Teknologi MARA Cawangan Pulau Pinang who have help and teach me about the concept and fundamentals of engineering during completion of my thesis.

Lastly, I would like to thank to those who involves directly or indirectly throughout the completion of my thesis especially my friends. I appreciate and thankful for all the guidance and cooperation given.

## ABSTRACT

Presently, water pollution is increasing by years. Water pollution is occur when there is pollutant or foreign substance contain in the water that decrease the quality of water and become toxic to living organism. One of the major causes that lead to water pollution are heavy metals. Heavy metals is the toxic substance even though at low concentration that can cause adverse effect. The objective of this research are to synthesis of titanium dioxide nanotubes (TNT<sub>s</sub>) decorated with silver nanoparticles (AgNP<sub>s</sub>) and to evaluate the removal of zinc and chromium ions by using the TNT<sub>s</sub> / AgNP<sub>s</sub> catalyst with different contact time and initial concentration of Cr and Zn ions. In this research, the TNT<sub>s</sub> were prepared by using anodisation process at constant 60 V for 20 minutes and by using EG / NH<sub>4</sub>F / K<sub>2</sub>CO<sub>3</sub> as electrolyte. Besides, the AgNP<sub>s</sub> were prepared by using salt reduction method with AgNO<sub>3</sub>, *K. brevifolia* extract and NaOH. Next, the TNT<sub>s</sub> / AgNP<sub>s</sub> were prepared by using wet impregnation method. Lastly, the removal of chromium and zinc ions were remove by putting the TNT<sub>s</sub> / AgNP<sub>s</sub> into each different concentrations which are 5 ppm and 10 ppm. Furthermore, the characterization of the, TNT<sub>s</sub>, AgNP<sub>s</sub> and TNT<sub>s</sub> / AgNP<sub>s</sub> were done by using Field Emission Scanning Electron Microscopy (FESEM), and Energy Dispersive X-ray Analysis (EDX) and for zinc and chromium ion removal were analysing it by using Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES). From the result obtained, TNT<sub>s</sub> / AgNP<sub>s</sub> has high efficiency for the removal of Zn ions since the percentage removal of 5 ppm and 10 ppm were 90.81% and 37.16% for Zn ions while percentage removal of 5 ppm for Cr ions was 9.53% respectively. Apart from that, the performance of Zn ions removal by using TNT<sub>s</sub> / AgNP<sub>s</sub> are better compared to Cr ions removal under visible light condition.