

**THE INFLUENCE OF GRADUAL COBALT
SUBSTITUTION ON THE CATALYTIC ACTIVITY OF
 $\text{Fe}_{3-x}\text{Co}_x\text{O}_4$ CATALYST**

ANEES NURZALIKHA BINTI ZAKARYA

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


UNIVERSITI TEKNOLOGI MARA

2017

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 :11/7/2017.....

ANEES NURZALIKHA BINTI ZAKARYA

Student ID : 2014412352

SUPERVISOR'S CERTIFICATION

We declared that we read this thesis and in our point of view this thesis is qualified in terms of scope and quality for the purpose of awarding the Bachelor of Chemical Engineering (Environment) with Honours

Signed: 

Date : ...11/7/2017...

Main Supervisor

Dr. Nor Aida Zubir

Faculty of Chemical Engineering

Universiti Teknologi MARA

Cawangan Pulau Pinang

13500 Permatang Pauh

Pulau Pinang

Nor Aida Zubir (Dr)
Koordinator Program
Fakulti Kejuruteraan Kimia
Universiti Teknologi MARA (Pulau Pinang)

Signed : 

Date : ...11/7/2017...

Co-Supervisor

Nur Fadzeelah Abu Kassim

Faculty of Electrical Engineering

Universiti Teknologi MARA

Cawangan Pulau Pinang

13500 Permatang Pauh

Pulau Pinang

NUR FADZEELAH ABU KASSIM
Pensyarah Kanan
Fakulti Kejuruteraan Kimia
UiTM Caw. Pulau Pinang

ACKNOWLEDGEMENT

First and all, I praise to Allah SWT, the almighty for providing me this opportunity and giving me the ability in finishing my research work with successfully. This thesis appears in its current form due to assistance and guidance of several people.

I would therefore like to offer my gratitude and thanks go to my supervisor, Dr. Nor Aida Zubir and Madam Nur Fadzeelah Abu Kassim as my co-supervisor, for their encouragement, guidance, helpful comments and correction in helping me finishing my thesis. I also would like to give my thanks to Faculty of Chemical Engineering, UiTM Pulau Pinang for providing the facilities and their assistance. Lastly, I kindly thank and appreciate my parents and my family for their material and spiritual support in all aspects of my life.

ABSTRACT

Acid Orange 7 (AO7) has been extensively used in industrial application especially for textiles industries. It was estimated that approximately 10-15% of dye was discharged as effluent without being treated. Combination of Fenton-like reaction with heterogeneous catalyst has been recognized as an effective way in removing organic pollutant. $\text{Fe}_{3-x}\text{Co}_x\text{O}_4$ catalyst has been introduced as promising catalyst by substituting cobalt into the magnetite structure. In this study, detailed investigation on the influence of cobalt substitution was performed in correlation with the catalytic performance of resultant catalyst. The $\text{Fe}_{3-x}\text{Co}_x\text{O}_4$ catalysts were synthesized through the co-precipitation method. The cobalt loading were varied at x value of 0.1, 0.2, 0.4 and 0.6 respectively. Then, 0.2 g/L of these resultant catalysts were used in the oxidative degradation of AO7 at condition of initial pH 3 with H_2O_2 concentration of 22 Mm. At different x value, $\text{Fe}_{3-x}\text{Co}_x\text{O}_4$ catalyst with x=0.4 exhibited higher performance on catalysis and adsorption at 30.88% and 13.34%, respectively. The analysis shown that at loading x=0.4, the catalyst have high pore size and pore volume at 10.346 nm and 0.0925 cm^3/g . Respectively, $\text{Fe}_{3-x}\text{Co}_x\text{O}_4$ catalyst also has better stability compared to pristine magnetite. It can be concluded that the substitution of cobalt provide positive influence toward improvement of catalytic performance.