OPTIMIZATION OF ACID ORANGE 7 DEGRADATION IN HETEROGENEOUS FENTON-LIKE USING $Fe_{3-X}Co_xO_4$ CATALYST

MARTUNIS ZAMZAMI BIN IBRAHIM

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 accordance with the regulation of Universiti Teknologi MARA. It is original and is the result of my own, unless otherwise or acknowledge as reference work.

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

Signed : .....

Date : 28/12/2016

MARTUNIS ZAMZAMI IBRAHIM

Student ID : 2013753677

SUPERVISOR'S CERTIFICATION

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

Signed : .....
Date : 28/12/2016 .....

Main Supervisor
Rasyidah Alrozi
Faculty of Chemical Engineering
Universiti Teknologi MARA
Pulau Pinang
13500 Permatang Pauh
Pulau Pinang

Signed : .....
Date : 28/12/2016 .....

Co-Supervisor
Dr. Nor Aida Zubir
Faculty of Chemical Engineering
Universiti Teknologi MARA
Pulau Pinang
13500 Permatang Pauh
Pulau Pinang

ACKNOWLEDGEMENT

First and above all, I praise God, the almighty for providing me this opportunity and granting me the capability to proceed successfully. This thesis appears in its current form due to the assistance and guidance of several people.

I would therefore like to offer my sincere thanks to all of them. My gratitude and thanks go to my supervisor Puan Rasyidah Alrozi, and co-supervisor, Dr Nor Aida Zubir for their warm encouragement, thoughtful guidance, critical comments and correction of the thesis. I also would like to thank to the staff of the Chemical Engineering Lab, especially En. Saiful Anuar Roswan, Puan Khaironniswah Abdul Samad, Puan Faezah Md Desa and Cik Siti Maznah Sulaiman for providing the facilities and their assistance throughout the laboratory session. Special thanks to my colleagues and friends for helping me with this project.

Lastly, I warmly thank and appreciate my parents for their material and spiritual support in all aspects of my life. This piece of victory is dedicated to both of you.

ABSTRACT

The oxidation process such as heterogeneous Fenton and/or Fenton-like reactions were considered as an effective and efficient method for treatment of dye degradation. In this study, the degradation of Acid Orange 7 (AO7) was investigated by using $Fe_{3-x}Co_xO_4$ as a heterogeneous Fenton-like catalyst. Response surface methodology (RSM) was used to optimize the operational parameters condition and the interaction of two or more parameters. The parameter that have been studied were catalyst dosage (X_1), pH (X_2) and H_2O_2 concentration (X_3) towards AO7 degradation. Based on analysis of variance (ANOVA) analysis, the derived quadratic polynomial model was significant whereby the predicted values matched the experimental ones reasonably well with regression coefficient of R^2 = 0.9399. Through the optimization study, the optimum condition for AO7 degradation was obtained at catalyst dosage of 0.84 g/L, pH of 3.14 and H_2O_2 concentration of 46.70 mM which resulted in 86.30% removal of AO7 dye. These findings present new insights into the influence of operational parameters in the heterogeneous Fenton-like oxidation of AO7 using $Fe_{3-x}Co_xO_4$ catalyst.