RESEARCH PROJECT

AMMONIA REMOVAL FROM FISH POND WATER USING SODIUM HYDROXIDE MODIFIED ZEOLITE

Submitted by :

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DEPARTMENT OF CHEMICAL ENGINEERING

FACULTY OF ENGINEERING

WIDYA MANDALA CATHOLIC UNIVERSITY

SURABAYA

2015

LETTER OF APPROVAL

The research entitled :

Ammonia Removal from Fish Pond Water Using Sodium Hydroxide Modified Zeolite

Which was conducted and submitted by :

Name : Jennifer Pieter Soetardji

NRP : 5203012017

has been approved and accepted as one of requirement for **Bachelor of Engineering** degree in Chemical Engineering Department, Faculty of Engineering, Widya Mandala Surabaya Catholic University by following supervisor/s and has been examined by the committees on May, 26th 2015.

Surabaya, June 01th 2015

Supervisor	Co-Supervisor
Suryadi Ismadji, Ph.D	Felycia Edi S., Ph.D
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Dean of Engineering Faculty	Head of Chemical Engineering Department
Suryadi Ismadji, Ph.D	Wenny Irawaty, Ph.D
NIK.521.93.0198	NIK.521.97.0284

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Surabaya, June 01th 2015
Student,

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PREFACE

The authors would like to thank God for His blessing that the Research Project entitled Ammonia Removal from Fish Pond Water Using Sodium Hydroxide Zeolite Modified has been accomplished. This report is a prerequisite in achieving Bachelor of Engineering degree in Chemical Engineering.

The writers realize that the completion of this report is achieved by the help of many people. There for, the writers would like to thank the persons below:

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5 Wenny Irawaty, Ph.D, as Head of Chemical Engineering Department
6 Suryadi Ismadji, Ph.D, as Dean of Engineering Faculty
7 Our parents and family who have given a lot of help and support, both materially and morally
8 Our lecturers, friends and also those who are too many to be listed by name that had contributed their kind assistance

The authors realize that this report is far from perfect, therefore any critics and comments which will better improve the research is gladly accepted. Lastly the authors hope that the report will be useful to all readers who need information regarding the research of the report.

Surabaya, June 01th 2015

The authors

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ABSTRACT

The excessive amount of ammonia could lethal for fish in aquaculture. Some of previous studies have been investigated that zeolite is very effective adsorbent to adsorb ammonium ion from water surface. Recently, the natural zeolite modified by sodium chloride to enhance the active site from the adsorbent, however it could adsorb much more ammonium ions from water. In this study, natural and modified zeolites were used to remove ammonium ions from NH_4Cl synthetic solution and Koi pond water. The objective of present study was to investigate the ability of zeolite to remove ammonium by modified zeolite with sodium hydroxide which is a strong base. The modification of zeolite was conducted using sodium hydroxide solution at 75^oC for 24 h. Langmuir, Freundlich, Sips, and Toth equations with their temperature dependent forms were used to represent the adsorption equilibria data. The Langmuir and its temperature dependent forms could represent the data better than other models. The pseudo-first order has better performance than pseudo-second order in correlating the adsorption kinetic data. The controlling mechanism of the adsorption of NH_4^+ from aqueous solution onto NatZ and 6M-Z was dominated by physical adsorption. The competition with other ions occurred through different reaction mechanisms so it decreases the removal efficiency of ammonium ions by the zeolites. For 6M-Z zeolite, the removal efficiency decrease from 81% to 66.9% in NH_4Cl synthetic solution comparing with Koi pond water. Thomas model can represent the experimental data for both adsorption of ammonia from aqueous solution or from Koi pond water. This continuous data experiment was calculated for represent breakthrough curves for the dynamic sorption data. The fitting of the models conducted by SigmaPlot software (version 12.0). The characteristics of adsorbent was analyzed by scanning electron microscopy (SEM) for surface morphology, X-ray Diffraction (XRD) data shows the kind of zeolite which is used in this experiment, X-ray Fluorescence (XRF) to convince the Na^+ ions were enhanced after zeolite has been modified with sodium hydroxide and nitrogen sorption to determine the pore volume. Based on the result, zeolite modified with sodium hydroxide can be suggested being a suitable ion exchange for ammonium ions removal, and it more potentially to uptake the ammonium ion than a natural zeolite and zeolite modified sodium chloride as previous study.