RESEARCH PROJECT

NANOCRYSTALLINE CELLULOSE FOR POTENTIAL APPLICATION OF DRUG DELIVERY

Submitted by:

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WIDYA MANDALA CATHOLIC UNIVERSITY

SURABAYA

2016

LETTER OF APPROVAL

The research entitled :

Nanocrystalline Cellulose for Potential Application of Drug Delivery

Which was conducted and submitted by :

Name : Stephanie Novina Saputra

Student ID : 5203013005

has been approved and accepted as one of the 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, 19th 2016.

Surabaya, May 26th 2016

Supervisor	Co-Supervisor
Suryadi Ismadji, Ph.D	Felicia Edy Soetaredjo, Ph.D
NIK. 521.93.0198	NIK. 521.99.0391

The Committees

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Dean of Engineering Faculty	Head of Chemical Engineering Department
Suryadi Ismadji, Ph.D	Wenny Irawaty, Ph.D
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Student,

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Surabaya, May 26th 2016
Student,

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PREFACE

The authors would like to thank God for His blessing that the Research Project entitled Nanocrystalline Cellulose for Potential Application of Drug Delivery has been accomplished. This report is a prerequisite in achieving Bachelor of Engineering degree in Chemical Engineering.

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

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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
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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, May 26th 2016

The authors

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Nanocrystalline cellulose (NCC) is an advanced material which can be used in many applications, such as pharmaceutical, health, food, chemical, and etc. Because of that, NCC is very potential to be developed from many kinds of raw materials. In this research, passion fruit peels waste is used as the raw material of NCC production, because this raw material contains cellulose until 26.52% wt. Besides that, the use of this raw material is to decrease the need of woods, where the big need of woods will give damages to the environment. If the need of woods is big, the forest exploitation will increase significantly. Because of that, the industrial waste likes passion fruit peels waste is needed.

In this research, NCC was applied in drug delivery system, where NCC was used as the adsorbent of tetracycline antibiotic. NCC is used in this application because of its biodegradable and easy to modify characteristics. NCC can carry the tetracycline antibiotic to the target in human body, and release that drug. From this application, the efficiency and effectiveness of the drug activity will increase significantly.

This research is aimed to study the NCC production from passion fruit peels waste and the adsorption isotherm, the adsorption kinetic, and the desorption kinetic of tetracycline antibiotic by NCC. From this research, the data which was obtained are the yield percentage of NCC in various variables of NCC production and the best equations for the adsorption and desorption process in its various variables.

In this research, the best condition was obtained (based on highest yield of NCC, 2.86% wt.) using 52% wt. of sulphuric acid concentration at 50°C. The materials used and obtained in this research were analysed using TGA, XRD, and SEM. This NCC was suitable as drug carrier of tetracycline antibiotic. It was proofed from the adsorption and desorption mechanism. This material can adsorbed tetracycline antibiotic as much as 251.7667 mg/g using 500 ppm as tetracycline initial concentration in 60 minutes at 30°C. The adsorbed tetracycline was released slowly in 12 hours, where the desorption efficiency reached 90.51%.