RESEARCH PROJECT

PREPARATION OF ANTIBACTERIAL BENTONITE – β LACTAM ANTIBIOTIC COMPOSITE

Diajukan oleh :

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FACULTY OF ENGINEERING

WIDYA MANDALA CATHOLIC UNIVERSITY

SURABAYA

2017

LETTER OF APPROVAL

The research entitled :

Preparation of Antibacterial Bentonite – β Lactam Antibiotic Composite

Which was conducted and submitted by :

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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 commitees on May, 23rd 2017.

Surabaya, May 31st 2017

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PREFACE

The authors would like to thank God for His blessing that the Research Project entitled Preparation of Antibacterial Bentonite – β Lactam Antibiotic Composite 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:

1. Suryadi Ismadji, Ph.D as Principal Supervisor and Felycia Edi Soetaredjo, Ph.D as Co-Supervisor
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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
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, May 31st 2017

The authors

ABSTRACT

Antibiotic potential for people who are injured get infection are high. First aid to evade the infection use antibiotics. Antibiotics have ability to inhibit or kill bacteria that cause infection. Tetracycline is antibiotic that usually uses for first treatment because of tetracycline easy to obtain. There are six classification of carbapenem antibiotic such as imipenem, ertapenem, mesopenem, and doripenem. Doripenem is one of the classification of carbapenem that can be obtained easily. Doripenem can be used for first aid if infection is happened. Silver usually uses too for avoiding infection but it is not easily to degrade. It is necessary to find antibacterial composites that easily to find and biodegradable.

The purpose of this research is to study the effect of pH, kinetic, and isotherm adsorption of doripenem into bentonite. The optimum condition of doripenem adsorption will be determined. After knowing the optimum condition, the antibacterial composite will be tested on *nutrient agar.*

This research has been done in 5 steps, purification of bentonite before it is used for adsorption using H_2O_2, tested the effect of pH doripenem on adsoption has been done and from the results show that the optimum pH to adsorp doripenem onto bentonite is at pH 3 (26.8035 mg/g), adsorption kinetics using bentonite as adsorbents fitted better with pseudo – first order model (R^2=0.9935) and it takes 48h until the doripenem cannot be adsorped onto bentonite surface. This mean doripenem loading into bentonite dominated by physiosorption, Isotherm adsorption of doripenem into bentonite and antibacterial composite that tested in *nutrient agar* makes wider area if the doripenem concentration is higher.

ABSTRAK

Potensi penggunaan antibiotik untuk orang yang terkena infeksi sangatlah tinggi. Pertolongan pertama untuk menangani infeksi adalah menggunakan antibiotik. Tetrasiklin adalah antibiotik yang biasanya digunakan untuk pertolongan pertama karena tetrasiklin mudah untuk ditemukan. Ada empat penggolongan dari antibiotik carbapenem, yakni imipenem, ertapenem, mesopenem, dan doripenem. Doripenem adalah salah satu anggota carbapenem yang dapat ditemukan dengan cukup mudah. Doripenem dapat digunakan untuk pertolongan pertama pada infeksi. Silver yang biasanya ada pada antibakterial sangatlah sulit untuk terdegradasi. Maka diperlukan antibakterial yang dapat dengan mudah terdegradasi.

Tujuan dari penelitian ini adalah untuk mempelajari efek pH, kinetik, dan isoterm adsorpsi dari adsorpsi doripenem ke bentonite. Kondisi optimum untuk adsorpsi doripenem juga telah ditentukam. Setelah mengetahui kondisi optimum, antibakterial komposit ini akan diuji ke nutrien agar.

Penelitian ini terbagi menjadi lima tahap, purifikasi bentonite sebelum digunakan menggunakan peroksida, tes pH untuk adsorpsi doripenem dan hasilnya adalah pada pH 3 (26.8035 mg/g), kinetika adsorpsi menunjukkan bahwa hasil mendekati persamaan pseudo-first dengan R^2=0.9935 dan membutuhkan 48 jam agara doripenem teradsorpsi sempurna ke bentonite. Hal ini menunjukkan bahwa adsorpsi doripenem ke bentonite termasuk adsorpsi fisika. Hasil tes nutrien agar menunjukkan bahwa semakin besar konsentrasi doripenem akan makin besar pula area bersih di sekitar well nutrie agar.

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