RESEARCH PROJECT

METAL-ORGANIC FRAMEWORK AS
A DRUG CARRIER OF FUROSEMIDE

Submitted by
Yanita Devi NRP. 5203016003
Ignatius Ang NRP. 5203017038

DEPARTMENT OF CHEMICAL ENGINEERING
FACULTY OF ENGINEERING
WIDYA MANDALA CATHOLIC UNIVERSITY SURABAYA
SURABAYA
2019
LETTER OF APPROVAL

Seminar of RESEARCH PROJECT for student with identity below:
Name : Yanita Devi
NRP : 5203016003

has been conducted on 27 May 2019, therefore the student has fulfilled one of several requirements to obtain Bachelor of Engineering degree in Chemical Engineering Department, Faculty of Engineering, Widya Mandala Catholic University Surabaya.

Surabaya, June 12, 2019

Principal Supervisor
Ir. Suryadi Ismadji, M.T., Ph.D.
NIK. 521.93.0198

Co-Supervisor
Felycia Edi Soetaredjo, Ph.D.
NIK. 521.99.0391

Chairman
Shella P. Santoso, S.T., Ph.D.
NIK. 521.17.0971

Secretary
Ir. Suryadi Ismadji, Ph.D.
NIK. 521.93.0198

Committees

Member
Wenny Irawaty, M.T., Ph.D.
NIK. 521.97.0284

Member
Irv. Setiyadi, M.T.
NIK. 521.88.0137

Authorized by

Dean of Engineering Faculty
Ir. Suryadi Ismadji, M.T., Ph.D.
NIK. 521.93.0198

Head of Chemical Engineering Department
Sandy B. Hartono, Ph.D., IPM
NIK. 521.99.0391
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NIK. 521.93.0198

Head of Chemical Engineering Department  
Sandy B. Hartono, Ph.D., IPM  
NIK. 521.99.0391
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NRP. 5203017038
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Student

Yanita Devi
NRP. 5203016003
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Surabaya, June 12, 2019

Student

Ignatius Ang
NRP. 5203017038
Authors give thanks to the Almighty God for all His blessings and mercy, so the Thesis entitled "Metal-Organic Framework as a Drug Carrier of Furosemide" can be completed on time. This thesis is one of the requirements for obtained a Bachelor of Engineering degree in the Chemical Engineering Department, Faculty of Engineering, Widya Mandala Catholic University Surabaya.

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Surabaya, June 12, 2019

Author
ABSTRACT

Recently, pharmaceutical industries have developed more than 40% NCE (New Chemical Entities) to satisfy the needs of rapid treatment toward various diseases. Nevertheless, majority of those developments have several problems for instance low solubility and/or low permeability thus a suitable delivery system is required. Furosemide is a loop diuretic drug with those several problems. To the best of our knowledge, utilizing nanoparticle with tunable porosity such as Metal-Organic Framework (MOF) as drug delivery of Furosemide has yet to be found.

Synthesis of Metal-Organic Framework (MOF) known as MIL-100(Fe) was conducted via non-solvothermal method at room temperature under stirring condition using FeSO$_4$.7H$_2$O, H$_3$BTC, and NaOH as the raw materials. Several experiments were conducted to observe the synthesis, loading, and release behaviors of Furosemide using MIL-100(Fe) as drug carrier. From the results obtained, the optimum molar ratio of NaOH added in the synthesis of MIL-100(Fe) was found to be X=3. The effect of adsorbent dose exhibits a decrease number in the value of $q_e$ and $q_t$ as the mass of adsorbent increases, vice versa. The adsorption kinetic could be represented by the pseudo-first-order model, while the adsorption isotherm fitted well with Langmuir isotherm model. The release of Furosemide from MIL-100(Fe) in PBS at pH 5.8 and 7.4 fitted well with the first-order kinetic and Korsmeyer-Peppas model, respectively, which demonstrated a sustainable release of the drug.
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