RESEARCH PROJECT

METAL-ORGANIC FRAMEWORK AS A DRUG CARRIER OF FUROSEMIDE

Submitted by

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WIDYA MANDALA CATHOLIC UNIVERSITY SURABAYA

SURABAYA

2019

LETTER OF APPROVAL

Seminar of **RESEARCH PROJECT** for student with identity below:

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has been conducted on 27 May 2019, therefor 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

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Surabaya, June 12, 2019

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PREFACE

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.

With the completion of this thesis, the author would like to thank:

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2. Felycia Edi Soetaredjo, Ph.D., as Co-Supervisor, who has given lots of guidance and direction;
3. Shella P. Santoso, S.T., Ph.D., Wenny Irawaty, M.T., Ph.D., and Ir. Setiyadi, M.T. as the committees;
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6. Parents and family of authors who have provided support material and non-material, so author can complete this thesis.

Finally, the authors hope that this thesis can be useful for development in science and technology in the future.

Surabaya, June 12, 2019

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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 $FeSO_4.7H_2O$, H_3BTC, 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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