CHAPTER I
INTRODUCTION

I.1. Background

Drug carrier is an inert substance that able to improve the effectiveness of drug therapy by controlling the release of drugs. Microcrystalline cellulose (MCC) is commonly used as the material for drug carrier. However, MCC is not an excellent drug carrier because of its low accuracy control over the drug release due to poor surface charge density (Song et al., 2016).

Nanocrystalline cellulose (NCC) is nano-sized material derived from natural cellulose. NCC has been extensively used in biomedical applications because of its biocompatibility, biodegradability and low toxicity. The vast surface area and negative charge on the surface indicate that large amounts of drugs can be bound to the surface of this material. Theoretically, NCC has higher total surface area per unit total volume due to its smaller size, but the surface area per individual NCC is lower compared to MCC, this directly contribute to higher surface charge density for precision control of drug release.

Drug carrier should have high adsorption and desorption ability. To improve the drug loading capability, the chemical modification of the drug carrier is usually conducted. In this study, rarasaponin extracted from *Sapindus rarak DC* as a natural surfactant was employed to modify NCC. So far, rarasaponin has been used as modifying agent for the removal of various hazardous substances from water or wastewater by many researchers, such as modify bentonite for methylene blue and malachite green removal (Kurniawan et al., 2012, Kurniawan et al., 2011), and kaolin for malachite green removal (Suwandi et al., 2012).

To the best of our knowledge, there is no information available on the use of this natural surfactant as a modifying agent of NCC. The commonly used surfactant for NCC modification is cetyltrimethylammonium bromide (CTAB) to bound hydrophobic anticancer drugs docetaxel, paclitaxel, and etoposide (Jackson et al., 2011), and curcumin (Zainuddin et al., 2017). Compared with synthetic surfactants, natural surfactants are more desirable because they are natural compounds, which are more biodegradable and less toxic (Rahman and Gakpe, 2008). This research can be a basic to the future development and application of NCC-rarasaponin as a drug carrier.

I.2. Research Objectives

1. To study the effect of the mass ratio of NCC and rarasaponin in the preparation of drug carrier.
2. To study the characteristic of NCC-rarasaponin.
3. To observe the isotherm and kinetics of adsorption process of tetracycline on the NCC-rarasaponin.
4. To observe the kinetics of desorption process of tetracycline from NCC-rarasaponin into phosphate buffer.

I.3. Problem Limitations

1. The nanocrystalline cellulose was prepared using Whatman No. 1 filter paper as the cellulose source according to the methods reported by Dong et al., (1998).
2. Rarasaponin extraction was conducted according to the methods reported by Kurniawan et al., (2011).
3. Tetracycline was used as a drug model.