CHAPTER I
INTRODUCTION

I.1. Background

Indonesia has a large amount of natural resources, one of them is turmeric. Turmeric has many functions for human life. Turmeric can be used for drug materials, herbs, dyes, and cosmetics (Rukmana, 1994). One of the compound that contained in turmeric is curcumin. Curcumin is the largest part of yellow pigment in turmeric, and can be used as anti-bacterial, anti-inflammatory, and anti-neoplastic (Meiyanto, 1999). Therefore, curcumin has a high potency for treatment of various diseases such as diabetes, cancer, and alzheimer. Yet, curcumin is difficult to be absorbed into the bloodstream and is hydrophobic.

One of the methods that can be used is utilization nanotechnology to produce porous material that can be used in drug delivery system (DDS). Silica-based porous material or usually called mesoporous silica nanoparticles (MSN) are widely used for delivering and enhancing the solubility of various drug molecules that has poor solubility. Some researchers have already utilized MSN as a curcumin carrier. But, utilization of MSN that modified with alginate still rarely encountered. Utilization of alginate will improve the carrier's ability to deliver curcumin.

In this research, MSN will be modified with alginate in various concentrations and the release profile of curcumin will be determined. After that, the release profile from different samples, at various concentrations pH according to pH conditions in the human body, will be analyzed. This research provides the benefit of obtaining DDS that

can enhance the release profile of curcumin. It is expected from continuous research, useful product can be obtained and also can be commercialized.

The improvement of curcumin release profile can enhance curcumin therapeutic effects. As result, the demand of curcumin as local herbs from Indonesia will be increasing. Definitely, this will be useful for the producers of curcumin in Indonesia.

Drug delivery system (DDS) is the process to deliver pharmaceutical things in living creature. There are various methods for drug administration i.e. oral and injection. Oral drug delivery has some benefits. Yet, it also faces some challenges for example a stability at low pH and targeting specific area. Further study is required to improve effectiveness of oral drug delivery. One of the methods that can be used is by using nanotechnology. The application of nanotechnology enable the synthesis and modification of mesoporous silica nanoparticles for drug delivery.

In this research, we will use mesoporous silica type IBN-2 with particles size around 100-300 nm and average pore size 9.5 nm which has 3D pore structure like cubic that has many interconnected channels (Han and Ying, 2005). To improve the effectiveness of MSN as a drug carrier, at first MSN need to be modified through functionalization, by adding alginate. The purpose of this research is to study the effect of APTES and alginate ratio, as well as optimum pH condition for mesoporous silica that modified with alginate in curcumin delivery process. The main difference with previous research is the application of IBN-2 type mesoporous silica nanoparticles that has specific pore size and pore structure.

I.2. Objective

- To study the synthesis of mesoporous silica nanoparticles modified with alginate at different ratio of APTES and alginate.
- To study the release profile of each alginate-curcumin sample at various pH of the solution, different ratio of APTES and concentration of alginate

I.3. Problem Limitation

- Drug example is curcumin.
- Mesoporous silica nanoparticles (MSN) used is IBN-2 type as a drug carrier.
- APTES and alginate are used to modify mesoporous silica nanoparticles.