CHAPTER I
INTRODUCTION

Chitosan is the second-most abundant naturally occurring polysaccharide. It consists of β-(1-4)-2-acetamido-2-deoxy-β-D-glucose and β-(1-4)-2-amino-2-deoxy-β-D-glucose. The well known properties of chitosan are biodegradability, biocompatibility, and nontoxicity. Although chitosan gives many advantages, the limitation of dissolution in only odor acetic solvent is obstacle to chitosan derivatization process. This leads to an attempt of changing the solvent system from acetic acid to either organic or water based system by especially chemical modification approach. The chemical modification provides various types of chitosan functions based on specified conditions and derivatized molecules. In the case of biomedical applications, the reaction in mild conditions using biological/bioactive molecules, and if possible, the processes in water-based system are considered as the key concept of the present work when designing the functional chitosan derivatives.

In order to apply chitosan in allergen delivery system, not only the above mentioned key concept but also the particle size of the product, allergen entrapment, prolonged release of allergen are in consideration. In addition, specific property as adjuvant of chitosan is combined. Thus, in Chapter III, the introductions of phenylalanine (as a hydrophobic biomolecule) and polyethylene glycol (as a hydrophophillic biocompatible molecule) on chitosan chain are proposed. Due to the self-assembly of hydrophobic core and hydrophilic corona formation, chitosan derivative can form the nanoparticle and shows colloidal stability in water. Although this work reached the target purposes based on nanoparticle formation and allergen delivery system, it still motivate us to design another type of functionalized chitosan which can be done without adding conjugating agent, catalyst, and purification steps.

Consequently, in Chapter IV, the copper-free catalyzed click chemistry based on the reaction between an azido-modified substrates and oxanorbornadiene moieties is selected to introduce on chitosan chain. In this case, chitosan-oxanorbornadiene is proposed as a novel chitosan derivative to functionalize further with various types of bioactive molecules based on azido-modified substrates without adding Cu catalyst and purification steps. Unfortunately, this chitosan

derivative is not absolutely dissolved in water which is a one of key concepts of the work.

Thus, water-soluble chitosan-oxanorbornadiene is proposed in Chapter V by additional conjugation of polyethylene glycol which can form hydration force with water molecule. The derivatization of oxanorbonadiene is studied in the presence of azido-gold nanoparticle which is the indicator of visual detection by changing surface plasmon resonance (SPR) due to aggregation of gold nanoparticles. This work proposes the chitosan derivative as a linker to accelerate gold nanoparticle aggregation via Cu-free cycloadditon and this strategy will be a potential use of visual detection in term of fast detection, ease of use, and cheapness.