

CHAPTER I INTRODUCTION

Chitin, the major polysaccharide of the exoskeletons of insects and crustacean shells, is composed of β -(1,4)-linked N-acetylglucosamine repeating units and is the second most abundant form of polymerized carbon found in nature. Chitosan is the fully or partially deacetylated form of chitin which contains 2-acetamido-2-deoxy- β -D-glucopyranose and 2-amino-2-deoxy- β -D-glucopyranose residue. Chitin and chitosan are copolymers of N-acetylglucosamine and glucosamine units.

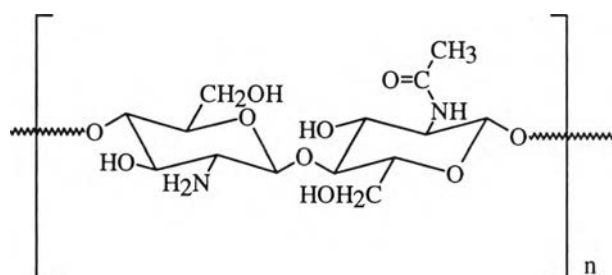


Figure 1.1 Structure of chitin/chitosan copolymer.

Much attention had been paid to chitin and chitosan in various applications owing to their specific structures and properties. For example, the chitin and chitosan have hydroxyl and amino groups which show ion entrapment properties. The high molecular weight and solubility, makes chitosan suitable for film casting or fiber formation. As a natural occurring polymer, chitin and chitosan are utilized as a biopolymer-chitosan conjugate or biomedical polymer. The biodegradability, is also an interesting point for their various applications.

The viewpoint of the present work was to examine the utility of chitosan as a blending agent for thermoplastic blends. The approach of the project was to modify the chitosan structure to promote the miscibility in blends with the common thermoplastics such as polyethylene. Owing to the structure of chitosan (and chitin) which has the rigid packing structure of carbohydrate and strong hydrogen bonding between polymer chains, it is very difficult to achieve miscibility in blends with other polymer materials.

The idea for chitosan modification was to use a surface treatment by silane coupling agent onto the chitosan main chain and a chemical modification of chitosan main chain itself. Although the former method is commonly used for blending of inorganic fillers, it can not be applied as easily to chitosan. Compared to silica, chitosan is less reactive and the hydroxyl groups of chitosan are not dispersed outward on the particle. Furthermore, silane coupling agents are expensive to compensate the cost performance of polyethylene or polypropylene blend.

In the present work, it is our interest to focus on the chemical modification of the chitosan main chain to introduce long chain alkyl groups or acylation of chitosan. Hydrophobicity induced onto chitosan main chain can be expected for the compatibility due to the interaction of long chain alkyls with polyethylene and polypropylene olefin chains. As an initial step, chitosan is mainly focused on the site selective reaction via the most reactive group of C-6 for the primary alcohol, and at C-2 for the amino group to induce the hydrophobicity onto the chitosan main chain with long chain alkyl groups.