CHAPTER I
INTRODUCTION

The use of biopolymers from renewable resources has become increasingly important because of their rich resources and low cost raw materials. Especially, the use of biopolymers as drug carriers for the drug delivery systems has gained a wide interest, mainly for their biocompatibility, biodegradability and nontoxicity.

Alginate is an anionic polysaccharide belonging to a family of binary copolymers arranged linearly in blocks of alternating mannuronate and guluronate sugar residues. There are three types of grouping arrangement, i.e. blocks of mannuronate, blocks of guluronate, and blocks of alternating mannuronate and guluronate unit. Due to its biodegradability, biocompatability and nontoxity, alginate has been widely used in biomedical applications (Hodsdon *et al.*, 1995 and Ottenbrite *et al.*, 1996). However alginate cannot retain its shape in aqueous solution due to its solubility in water. In order to prevent dissolution of alginate in aqueous solution, the cross-linking formation of sodium alginate can be induced by the addition of polyvalent cations such as Ca^{2+}, resulting in gel formation. Divalent cation-induced alginate gelation is known to arise mainly at junctions in the guluronate sequence rich chain region, which are called 'egg box junctions'. Since blocks of mannuronate and blocks of alternating mannuronate and guluronate do not participate in the gelation process (Murata *et al.*, 1993), carboxyl groups of these parts are still vacant that can interact with cationic polymer. Therefore, many researcher have been interested in the preparation of alginate coated with a cationic polymer which can be occurred by electrostatic interaction between cationic functional groups of coated polymer and carboxyl groups of alginate. The method of coating with cationic polymers is employed either to increase the stability of alginate or to improve the pH-sensitive performance. The gel formation of sodium alginate in the presence of calcium ions and the coating of alginate with cationic polymer have been studied mainly in the forms of beads and microsphere systems and reported for various applications such as for hemoglobin encapsulation (Huguet *et al.*, 1994), oral delivery of insulin (Hari *et al.*, 1996), bovine serum albumin carriers (Vanderberg *et al.*, 2001) and drug delivery systems (Gonzalez-Rodriguez *et al.*, 2002).

Chitosan is an aminopolysaccharide derived from chitin via deacetylation by alkali hydrolysis. It is a copolymer consisting of β(1→4)-linked 2-acetamido-D-glucose unit and β(1→4)-linked 2-amino-D-glucose unit (Lim *et al.*, 1998). Chitosan has attracted attention in biomedical and pharmaceutical fields because of its reactive functional groups and favorable properties of biodegradability, low toxicity and biocompatibility (Remunan-Lopez and Bodmeier, 1996). Chitosan is one of a few natural cationic polyelectrolytes. It is known to form electrostatic interaction with anionic polymers such as alginate (Takahashi *et al.*, 1990; Dutkiewicz and Tuora, 1992; Mi *et al.*, 1997; Yan *et al.*, 2000; Mi *et al.*, 2002), carboxymethyl cellulose (Zhang *et* al., 2001), κ-carrageenan (Sakiyama *et al.*, 1993) and pectin (Yao *et al.*, 1996). Chitosan was applied for coating on alginate beads through the formation of an electrostatic interaction between amino group of chiotsan and carboxyl group of alginate.

In this research, calcium alginate films with and without chitosan coating were prepared and characterized. The effects of cross-linking with calcium ion and chitosan coating on mechanical properties, swelling behaviors and drug release characteristics of alginate films were investigated.