CHAPTER II
LITERATURE SURVEY

2.1 Chitosan based polymer blend

Kim *et al.* (1992) studied the permeation of riboflavin and insulin through crosslinked poly(vinyl alcohol)/chitosan blend membrane. The permeability coefficient of both solutes through the crosslinked poly(vinyl alcohol)/chitosan blend menbrane exhibited a pH dependence and permeated through the free water region in the swollen blend membrane. The permeation rate of solutes in acidic solution was greater than that in neutral solution due to the water content, amount of free water and freezing bound water of the membrane increased.

Ratto *et al.* (1996) reported that the phase behavior of the chitosan/polyamide blend is influenced by the preparation conditions. Characterization of the blends by Differential Scanning Calorimeter (DSC) and Dynamic Mechanical Analyzer (DMA) revealed partial miscibility of chitosan with nylon 4. Blending of chitosan with nylon 4 could enhance mechanical properties of the blends.

Guan *et al.* (1998) presented paper describing the phase behavior of chitosan/viscose rayon blends. The phase behavior of the blend was influenced by its composition with or without carboxymethylated chitosan (CM-Cs). Characterization of the blend film by DSC and DMA revealed partial compatibility of chitosan with viscose rayon. Results of Transmission Electron Microscope (TEM) showed that the addition of CM-Cs into the blend could improve the compatibility of chitosan and viscose rayon.

Hasegawa *et al.* (1994) studied on preparation and characterization of cellulose-chitosan blend films. Blending of cellulose with chitosan led to desirable characteristics, including improved mechanical properties, and increased solute permeability of chitosan. This is due to the interaction between cellulose, chitosan and water molecules in the films. The presence of chitosan molecules may lead to the decrease in the domain size of cellulose and increase in the interfacial region between cellulose and chitosan domain.

Guofeng *et al.* (1991) reported that the blend of sulfated chitosan, carboxymethyl PVA, and PVA-g-HEMA-AN had a better blood compatibility than pure chitosan-PVA blend. The blood compatibility of these blends was contributed to sulfate and carboxylic groups, high water contents of the blend and microphase separated structure.

Suto *et al.* (1996) studied the blend film of hydroxypropyl cellulose and chitosan with crosslinking by dialdehydes (glyoxal and glutaraldehyde) as a crosslinker and hydrochloric acid as catalyzer. The solubility of the crosslinked blend film cast from gyloxal system was greater than that from glutaraldehyde system.

Chen *et al.* (1997) reported the conformation of silk fibroin in silk fibroin/chitosan blend membrane analyzed by IR spectrophotometer, X-ray diffractometer, and Raman spectrophotometer. The results showed β-sheet conformation of silk fibroin when the silk fibroin content in the blend membrane were 10%-80%(w/w), while the pure silk fibroin membrane showed random coil conformation. This is due to the strong hydrogen bonding between chitosan and silk fibroin that can be called 'Polymer-induced conformation transition'.

2.2 Chitosan based hydrogel

Chen *et al.* (1997) studied a semi-interpenetrating polymer network (semi-IPN) composed of glutaraldehyde-chitosan and silk fibroin. The FTIR spectra of the semi-IPN manifested that the chitosan and silk fibroin had a strong hydrogen-bond interaction and formed an interpolymer complex. The semi-IPN showed good pH sensitivity and ion sensitivity and also act as an "artificial muscle" because its swelling-shrinking behavior exhibited a fine reversibility.

Yao *et al.* (1994) studied the swelling kinetic and release characteristic of crosslinked chitosan/polyether polymer network (semi-IPN) hydrogels. These hydrogels exhibited the greater degree of swelling in an acidic pH range. The release of chlorhxidini acetas from the semi-IPN discs depended on pH of the solution. At the beginning of pH=1.0, the release rate was high, whereas no drug released at pH=7.8.

Genpeng *et al.* (1991) developed collagen-chitosan composite hydrogel for contact lens application. This hydrogel combined the high hydrophilicity of collagen with the strong mechanical strength of chitosan. By blending with chitosan, the hydrogel also indicated a higher optical transmittivity and biostability than the hydrogel prepared solely from collagen.

Yao *et al.* (1996) reported about the swelling behavior of pectin/chitosan complex films. The degree of swelling increased sharply when pH was less than 2 and larger than 7. The dissociation of electrolytic dissociation of carboxyl groups was the reason for swelling in alkaline medium.

2.3 Silk fibroin based film

Freddi *et. al.* studied the preparation and characterization of silk fibroin (*Bombyx mori*)/cellulose blend films. The crystalline structures of regenerated fibroin and cellulose were β-form and cellulose II, respectively. The mechanical properties showed that both strength and elongation at break of silk fibroin films were improved by blending with cellulose. IR spectra exhibited changes in the skeletal frequences of silk fibroin, suggesting the occurrence of intermolecular interactions between fibroin and cellulose through hydrogen bond formation.

Gotoh *et al.* (1996) studied the physical properties and structure of poly(ethylene glycol)-silk fibroin conjugate films. These conjugate films were prepared by chemical modification of solubilized silk fibroin in 2[o-methyoxypoly(ethylene glycol)]-4,6-dichloro-s-triazine (PEG1). In DSC thermogram of PEG1-silk fibroin film, it was indicated that the miscibility between PEG1 and silk fibroin was poor. The tensile tests of PEG1-silk fibroin and silk fibroin films revealed that the PEG modification of silk fibroin could improve the elongation at break but reduce the tensile strength.

Tsukada *et al.* (1994) reported that the degree of compatibility existed in *Antheraea pernyi/Bombyx mori* silk fibroin blend films was low when the films were cast together from an aqueous solution. The presence of separated crystalline phases characteristic of each individual component of the blend was shown clearly by DSC and dynamic mechanical curves.

Chen *et al.* (1993) investigated the transport of pharmaceutical through silk fibroin membranes prepared from Chinese cocoon. The permeability coefficient of 5 kinds of pharmaceuticals, i.e. 5 fluorauracil (5FU), L-(+)-ascorbic acid (Vc), resorcinol (Res.), sodium phenolsulfonate (SPS) and benzyltrimethylammonium chloride (BTAC), could be regulated

by changing the pH value of the external solution. The silk fibroin membrane was an amphoteric ion exchange membrane composed of both weak acidic and weak basic groups and it was expected to be used as the matrix of the drug delivery system with pH-responsive function.

Yoshimiza *et al.* (1990) presented the paper about the conformation transition from random coil to β-sheet occurred at the surface of silk fibroin membrane immersing in 80% aqueous methanol. The observation from high resolution 13C-NMR showed that the random coil conformation whose segmental motion was very fast remained in the inner part of the swollen membrane. The fraction of this portion reduced with increasing methanol treatment time in the sample preparation.