CHAPTER I
INTRODUCTION

Blends of polymeric materials obtained from renewable resources are of great interest in the production of new green products. Polymer blends bring outstanding properties of such biomaterials that are combined together in order to create new biopolymeric materials with desirable properties.

Chitin, or poly β-(1-4)-*N*-acetyl-D-glucosamine, is the second most abundant polysaccharide resource found in mature after cellulose. Chitin is a major structural component in the exoskeleton of arthropod and cell walls of fungi and yeast (Jayakumar *et al.*, 2010a). In commercial production, chitin has been extracted from byproduct of the seafood industry so the raw material of chitin is readily available and inexpensive. In addition, the preparation of chitin can also be considered as an effective solid waste management. Chitin exhibits several interesting bioactivities, such as biodegradability, low toxicity and good biocompatibility. These remarkable properties come from the unique functional groups in the structure of chitin (Peesan *et al.*, 2003). Consequently, chitin has been extensively used in a variety of medical applications, such as tissue engineering, drug delivery, and cancer diagnosis (Jayakumar *et al.*, 2011).

However, the existence of high crystallinity of chitin limits its solubility in common solvents. Hence, the carboxymethyl chitin (CM-chitin), a water-soluble derivative of chitin, becomes much more interest. CM-chitin is synthesized by carboxymethylation reaction of chitin. An introduction of carboxyl groups into chitin structures interrupts both inter- and intra-hydrogen bonding, thus improving the solubility of the resulting chitin derivative — CM-chitin. Recently, much attention has been paid to CM-chitin as a wound dressing material because it provides versatile properties, including retaining moist environment (Kumar *et al.*, 2010), enhancing wound healing properties (Jayakumar *et al.*, 2011), and being biocompatible (Peesan *et al.*, 2003). Since the CM–chitin-based materials are brittle, blending of CM-chitin with other flexible biomaterials is necessary in order to obtain the desirable mechanical properties as well as ease of handle.

Natural rubber, *cis*-1,4-polyisoprene, is naturally produced by the *Hevea brasiliensis* trees. Due to the outstanding flexibility, natural rubber is one of the most appropriate materials for blending with CM-chitin. Nevertheless, the presence of protein in the natural rubber latex can cause severe allergy in sensitive persons (Wagner *et al.*, 1999). Thus, deproteinization step is an important process to ensure that natural rubber is safe to be used as health care products.

Besides the addition of natural rubber in order to improve flexibility of the film, a plasticizer which is selected to add into the blend is an attractive choice to improve flexibility of the film. One of the plasticizers which widely used as plasticizer for biomaterial processing is glycerol. The interested advantages of glycerol are non-toxicity, colorless, odorless, complete solubility in water, and extrusion process improvement (Follain *et al.* 2006). In addition, glycerol can also act as a chain extender in polymeric structure that it can increase the flexibility of biomaterials.

Because the prepared polymeric biomaterial was used as a wound dressing application, it has to contact with some liquid or exudates from a wound. But due to the main component of the film is CM-chitin which can completely soluble in water. Then the blend films need to crosslink in order to form water-insoluble materials before use as a wound dressing application. The selected crosslinking agent is glutaraldehyde because it can form chemical bond between CM-chitin chains and need a little crosslinking time to form chain networks (Zhang *et al.*, 2006). However, glutaraldehyde is toxicity for human body. So it needs to control the appropriate amount of glutaraldehyde in crosslinking process as well.

In this present study, CM-chitin/deproteinized natural rubber blend was prepared before being fabricated into film. To evaluate the potential use of the CM-chitin/ natural rubber blend film as a new polymeric biomaterial for wound dressing application, the effect of blend ratios on morphology, mechanical properties, thermal properties as well as cytocompatibility were investigated.