# CHAPTER I
# INTRODUCTION

At present, artificial bone joint materials play an important role in bone surgery. In most cases, polymeric materials with biocompatibility are suitable due to the requirement about less tissue irritation. Considering some specific cases of bone therapy, the first aid is to fix up the fracture bone followed by the generation of the bone tissue. In this case, the first aid needs material with biodegradability, biocompatibility, and osteoconductivity including adhesiveness. Thus, the artificial glue compound for bone therapy is one of the effective approaches.

Chitin-chitosan is an attractive material to apply for bone therapy, with the properties of biocompatibility (Singh *et al.*, 1994), biodegradability (Mark *et al.*, 1985), non-toxicity (Chandy *et al.*, 1992), and osteoconductivity (Lahiji *et al.*, 2000). Chitin-chitosan also provides crosslinkable sites, i.e., hydroxyl and amino groups that are useful for producing a gel. In addition, the amino group in chitosan tends to form cationic species, which provides stable ionic interaction. Since hydroxyapatite is the main inorganic component in bone, the formation of chitosan-hydroxyapatite via ionic interaction is considered to be a practical pathway to obtain composite material. Up to now, various methods of chitosan/hydroxyapatite have been reported, for examples, coprecipitation of chitosan with $H_3PO_4$ and $Ca(OH)_2$ by heat treatment in saturated steam (Yamaguchi *et al.*, 2001), and alternate soaking of chitosan gel with $CaCl_2$ and $Na_2HPO_4$ to allow hydroxyapatite formed in the matrix (Tachaboonyakiat *et al.*, 2001).

It should be noted that chitosan/hydroxyapatite composite proposed in the past is in the forms of gel (Tachaboonyakiat *et al.*, 2001) or powder (Tokura *et al.*, 2001), which the applications are based on the treatment rather than the bone fixation. On this viewpoint, the development of chitineous glue is a potential way to obtain a new compound for bone therapy in the step of bone fixation. The strategy is based on glue type of chitosan/hydroxyapatite by functionalizing chitosan with epoxy group. The ring opening reaction of epoxy as well as the crosslinking with amino groups can be expected for the adhesion properties. The alternate soaking

process (Tachaboonyakiat *et al.*, 2001) is considered for the formation of hydroxyapatite in the chitosan-epoxy matrix.