CHAPTER I
INTRODUCTION

Tissue engineering has been used for regenerating tissue shape and generating biological substitute. Moreover, it can be regenerated the lost skins or organ functions by seeding human's own cell on biocompatible and biodegradable materials as scaffold. Due to it has the porous microstructure that can grow tissues (Hubbell, 1995 and Kim *et al.*, 1998 and Sundararajan *et al.*, 1999). The performance of scaffold depends on pore morphologies, hydrophilicity, structure including and distribution which have adequate connectivity. In the recent year, a number of studies have shown the importance of selecting the suitable biomaterial scaffold which mimics the condition of tissue, not only synthetic but also natural material. However, the problem of synthetic polymers is poor degradability and risks of compatibility (Junping et al., 2007). For these reasons above, scaffold from natural material such as cellulose collagen and chitosan are attractive (Sasiprapha, 2006).

One of the applications in dental field is absorbable collagen wound dressing (CollaTape®, CollaCote®, and CollaPlug®).This material has been widely used to cover the oral wounds created during dental surgery, to control bleeding and protect wound's surface from damage. Absorbable collagen wound dressing is soft, white and high porosity. Despite, more practical to use to substitute this kind of the versatile properties, it is expensive. Therefore, it is important to find material that commercial wound dressing. Chitin-chitosan is an alternative material to choose due to its second most naturally available polymer obtained mainly from shells of marine crustaceans, shrimps and crabs (Rinaudo, 2006). Furthermore, chitosan is known for being biocompatible, implantation and it can be metabolized by human enzyme (Berger *et al.*, 2003). Thus, the development of chitosan materials for biomedical i.e. cosmetics, tissue scaffold, drug delivery (Oungbho *et al.*, 1997).

Aerogel is a material prepared by sol-gel method through hydrogel and freeze-drying to produce aerogel (Philippe *et al.*, 2002). Based on its high porosity, cell adhesion property and low density, aerogel is one of promising materials for tissue scaffold in the near future (Fricke *et al.*, 1997). Clay is an inorganic material that offers the hybridization with organic polymeric material by simply freeze-drying

clay, fabric-like material as a scaffold backbone can be formed (Mackenzie, 1952). The incorporation of clay in polymer matrices to form is a good strategy to develop material with mechanical properties and light weight as seen in the case of i.e. *N*-isopropylacrylamine (Bandi *et al.*, 2005).

The present work focuses on the development chitosan/organoclay aerogel nanocomposite. In the first step, the work proposed a unique homogeneous water-based system to form chitosan hydrogel without the use of acid solvent and aldehyde crosslinker. The work shows the change of water-based chitosan from hydrogels to aerogels including the specific properties of the aerogels obtained. The work extends to the study on chitosan hydrogel nanocomposites and the consequent improvement of chitosan aerogels.