CHAPTER I
INTRODUCTION

Wound dressing materials have been developed for a long time. There are two types of wound dressing materials. For the conventional wound dressings such as cotton gauze can absorb exudates but it cannot provide moist environment that results in stripping off the new regenerating skin and causing some pain while removing the wound dressing off the skin. Advance wound dressings have improved the efficiency of wound treatments because it can retain and create a moist environment around the wound, including synthetic polymers and biopolymers (Boating J.S. *et al.*, 2008).

In the present day, biopolymers are very interesting materials because of environmentally friendly, biodegradable, biocompatible and non-toxic which is an important factor in wound dressing material.

Among various types of biopolymers, bacterial cellulose is a good candidate to use as wound dressing materials. Bacterial cellulose is a good candidate to use as wound dressing materials. Bacterial cellulose (BC) can be synthesized by *Acetobacter xylinum* in the form of ultrafine 3D network of cellulose nanofibers. BC displays unique properties such as high tensile strength, high crystallinity, biocompatibility, non toxic, hydrophilicity, high purity and high water absorption capacity (Czaja W.*et al.*, 2007). Bacterial cellulose is considered as an ideal wound dressing material. Due to the unique properties, bacterial cellulose can provide moist environment, promote the wound healing process, and has excellent molding to all facial body contours. Recently, many researchers developed bacterial cellulose composites for using as wound dressing materials such as the incorporation of bacterial cellulose with chitosan (Phisalaphong & Jatupaiboon, 2008, (Zhijiang C *et al.*, 2011), Ag nanoparticles (Thawatchai M. *et al.*, 2008), AgCl nanoparticles (Marta S. *et al.*, 2012), ZnO (Chaiyapurk K. *et al.*, 2013), collagen (Cai Z. *et al.*, 2010) and polyethylene glycol (PEG) (Juntaro J. *et al.*, 2012).

However, in a large scale production of BC pellicles, damage from tearing of BC pellicle may occur during cultivation, sterilization, and packing into packaging.

In order to reinforce BC pellicles, BC composites consisting of fabric embedded in the BC pellicles were fabricated. Cellulose, nylon, and polyester fabrics were used to investigate the effect of the types of fabrics on mechanical properties, morphology, water absorption capacity, and water vapor transmission rate of the composites. In addition, the surface of the fabrics was modified by dielectric barrier discharge (DBD) plasma treatment before cultivation in culture medium containing *Acetobacter xylinum*. Dielectric barrier discharge (DBD) plasma is widely used to modify the surface properties of polymers in many applications. By applying DBD plasma treatment, hydrophilicity, and surface roughness of the fabrics could be enhanced. Recently, several studies have reported on the application of DBD plasma for surface modification of polymers such as polyester non-woven fabric (Geyter N.D. *et al.*, 2006), viscose fabrics (Kramar A. *et al.*, 2013), polycapolactone (Hyun *et al.*, 2009) and polyamide 6 films (Borcia G. *et al.*, 2005).

In this study, by applying DBD plasma treatment, hydrophilicity, and surface roughness of the fabrics could be enhanced. The effect of DBD plasma treatment on production yield, change in chemical structure of the plasma-treated fabrics, morphology, mechanical properties, water absorption, and water vapor transmission rate of the BC composites was examined.