

CHAPTER I

INTRODUCTION

Normally, natural raw silk is consisted of two main components, fibroin (70-75 %) and sericin (25-30 %). Sericin has dull appearance, which is a harsh and stiff feeling to the fiber and hides the whiteness, brightness and shininess of silk. Furthermore, it prevents silk dye ability. Therefore, degumming process (or sericin removal) is important and required to get the desirable properties of silk fiber (Mahmoodi *et al.*, 2010). Nowadays, several degumming processes have been developed, such as extraction with hot water, soap-alkali boiling, enzymatic processes, degumming in synthetic detergent, and boiling in acidic solutions, etc. However, all the methods mentioned are not an environmentally friendly because they are thermal and wet-chemical processes which produce enormous amount of wastewater or increase the cost of water treatment. Moreover, these methods use large amount of water and energy (Long *et al.*, 2008). Due to the environment concerned, it is interesting to develop a new and effective degumming method.

Non-thermal plasma has been widely used to modify the surface properties of polymer and textile material in the last years because it is one of environmental friendly process, which is chemical and water free process, rapid, low energy consumption and highly surface specific. Non-thermal plasma has ability to change the surface properties of a material by both chemical and physical modification of external layers without change the bulk properties of material. Thus, the plasma treatment is alternative method which could replace wet chemical process to modify the surface properties of polymer and textile materials. Reactive species of plasma which are generated by ionization can induce very different phenomena such as cleaning, etching, activation, grafting and polymerization depending on the plasma condition: gas used, working pressure, working power and exposure time (Shishoo, 2007). Plasma etching is the key process to remove surface material from a substrate which can proceed by chemical reaction or physical bombardments. Non-polymerizing gases like helium, argon, oxygen, nitrogen and air can be used as etching gas (Kan and Yuen, 2006). Nowadays, there is only one report on the application of plasma pretreatment for improving degumming efficiency. According

to Long et al. (2008), low-pressure argon plasma is used by combining with a short wet chemical process under mild conditions. However, no systematic study has been reported for the effect of plasma treatment, only on the degree of degumming of silk.

The objective of this work was to study the effects of plasma parameters on the degumming process of Thai silk. The plasma parameters, such as working power, exposure time, flow rate of gas and temperature were studied. The degumming efficiency, physical properties and morphology of silk degummed by the proposed method were determined and compared with a standard conventional degumming method.