CHAPTER 1
INTRODUCTION

Nanofibers are fibers with their diameters in nano-scale. Nanofibers can be produced from electrospinning technique, which is a process that uses an electric field to control the formation and deposition of polymers. This process is remarkably efficient, rapid, and inexpensive (Matthew *et al.*, 2002). The small diameter fibers provide a large surface area to mass ratio. Electrospinning produces a single continuous filament that is collected on a grounded target as a nonwoven fabric. This technique provides a lot of pores on fibers surface. Nanofibers may be of some uses to applications that require a material with has a high surface to mass or volume ratio and a high porosity. These characteristics are essential for various advanced applications such as separation membranes, wound dressing materials, artificial blood vessels, composite reinforcements, biodegradable or biocompatible scaffolds (Choi, 2004), drugs delivery carriers, protective clothing (Lu, 2006). These nanofibers can also be used in the food Industry applications such as food packaging material, antibacterial nanofiber, nanomembrane filtration for water and food applications and nanofiber ion exchanger material.

Gelatin has a wide range of applications in the food, pharmaceutical, and photographic industries. It is a polypeptide obtained by hydrolytic degradation of collagen, the major constituent of animal connective tissue. Gelatins are produced on a large scale from skin and bones of mammalian origin (mainly beef and pork) by alkaline or acidic extraction (Veis, 1964). Processing of fish leads to a large amount of waste. Fish processing waste after filleting is approximately 75% of the total fish weight and 30% of the waste is in the form of bones and skins. Fish skins can be processed into gelatin, thus contributing to solving the problem of waste disposal and in addition creating a value-added product. Recent outbreaks of mad cow disease and the foot and-mouth disease crisis have increased the demand for kosher food which is prepared according to Jewish law and halal food which is prepared according to Muslim law have

created a demand for fish gelatin for food applications (Muyonga, Cole, and Duodu, 2004).

However, no information regarding the nanofiber from fish skin gelatin from fish processing wastes, has been reported. Therefore, production of electrospun nanofiber from fish skin gelatin would be a means to fully use of those wastes and produce value-added products.

This work can be divided into two parts. In the first part, chemical and physical characteristics of gelatin were explored. For the second part, the effects of solvent concentration and gelatin concentration on the morphology and mechanical property of electrospun gelatin nanofiber were studied. Moreover, electrospun gelatin nanofiber mats were crosslinked in order to improve their mechanical properties.

The objectives of this research are to investigate the characteristics of gelatin from fish skin and the effect of solvent, including solvent concentration that affects solvent acidity, gelatin concentration, and solution properties on the morphology and the mechanical property of electrospun gelatin nanofiber mat.