CHAPTER I
INTRODUCTION

Electrospinning is a process by which polymer nanofibers (with diameter lower than thousand nanometers and lengths up to kilometers) can be produced from an electrostatically driven jet. Various polymers have been successfully electrospun into ultrafine fibers in recent years, mostly from polymer solutions or melts. When diameters of polymer fiber materials are shrunk from micrometer to nanometers, there appear several interesting characteristics such as very large surface area to volume ratio (this ratio for a nanofiber can be as large as 10^3 times of that of a microfiber), flexibility in surface functionalities, and superiority in mechanical performance. Significant progress has been made in this area in the past few years and this technology has been explolted in a wide range of applications.

Electrospinning is a unique process that uses an electrical field to create an electrically charged jet of polymer solution or melt, which dries or solidifies to leave a polymer fiber. The properties of fiber obtained from this process depend on two types of parameter, the first is system parameters including molecular weight, moleculaar weight distribution, architecture of the polymer e.g. branched or linear chain and solution properties (viscosity, conductivity and surface tension). The second one is processing parameters including electrical field strength, flow rate, solution concentration, distance between the capillary and the collector, and ambient parameters (temperature, humidity and air velocity in the chamber).

Some advantages of electrospining process are simple equipment, requiring a short time, cost the effective process and producing a very high orientation fiber with very small pore sizes. Thus, the obtained nanofibers will not only be useful in filters, but also as supports for catalysts in high temperature reactions, in composites to improve mechanical properties, or for thermal management in semiconductor devices.

Therefore, the electrospining process has regained more attention probably due in part to a surging interest in nanotechnology, as ultrafine fibers

or fibrous structures of various polymers with diameters down to submicrons or nanometers can be easily fabricated with this process.

Up to date, it is generally believed that nearly one hundred different polymers, mostly dissolved in solvents yet some heated into melts, have been successfully spun into ultrafine fibers using this technique. Strangely enough, although the electrospinning process has shown potential promising and has existed in the literature for quite several decades, its understanding is still very limited.

Polystyrene is one of most useful plastic. It has high electrical resistance and low dielectric loss. Generally a brittle PS can be made into a certain degree of flexibility by fiberization and polymer fibers have been produced by electrospinning. Because polymers fiber prepare by this technique were able to achieve fiber diameters in the range of nanometer to a few micrometers.

In this work, attempt was made to try to understand the fundamentals of influent of solvent on morphological appearence of the as-spun polystyrene fibers. The characteristics of the prepared solutions were evaluated by a surface tension tester, a viscometer, a conductivity meter and the surface morphology and diameters of the as-spun fiber were investigated by a scanning electron microscope.