



Polymer Concentration Effect on Nanofiber Growth Using Pulsed Electrospinning

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ABSTRACT

Owing to routine necessity to materials with more capabilities and smaller dimensions, researchers have designed and advanced new sorts of materials. Excellent properties of nanofiber such as high porosity, large surface area to the volume ratio, unique mechanical performance (tensile strength and hardness), flexibility causing to introduce as ideal material for medical, filtration, energy devices, textile, and tissue engineering, optical and electrical applications. Based on the pulsed system, a new electrospinning device is developed, designed and fabricated. The basic model of electrospinning process is represented. However, the nanofibers which are produced are characterized by Fourier Transform Infrared (FTIR) and Scanning Electron Microscopy (SEM). In recent years, various strategies for manufacturing of nanofiber had been used which includes self-meeting, drawing, phase separation, template synthesis and electrospinning. Among these strategies, electrospinning is a favorite approach, as it's simple and value-effective, and the only manner extended to mass production of non-stop nanofibers from different polymers. In electrospinning approach, the electrostatic force

is used to produce thin fibers by using melting solutions or a polymer and fibers which are produced have thinner diameter and larger surface area to the volume ratio than other methods.

The process of electrospinning produces fibers based on natural materials and polymers as well as it is used in metal oxides, metals, composite materials and ceramics. In electrospinning process, the effects of voltage and concentration depend on the collector rotation. The three various voltages with three different solutions of polystyrene are used to produce several nanofibers polymer. Hence, the parameters affecting on the electrospinning process and morphology of the fibers are divided into the three popular elements: process factors, ambient factors and solution properties.

In this research, a new nanofiber is produced by customized pulsed method. The results of experiment reveal that the increase in concentration of polymer enlarges the nanofiber thickness while increase in applied voltage causes decrease in thickness of nanofiber. The outcomes are compared with comparable studies. In our research, we use the 10 KV voltage instead of 20 KV voltage as mentioned

in the literature. The result obtained show that the proposed model has good adjacency with respect to analytical and experimental facts. The results show increase in the applied voltage reduces the thickness of fiber while enlarges the porosity on the sample surface.

Keywords: Electrospinning; Nanofibers; Pulsed system; Concentration; Polystyrene