INVESTIGATION OF PARAMETERS AFFECTING DIAMETER OF PAN NANOFIBERS PRODUCED BY A MODIFIED ELECTROSPINNING METHOD

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Abstract: The purpose of this research is to evaluate the effects of some parameters on the diameter of electrospun PAN nanofibers by a modified method. In this method despite of the conventional electrospinning system, two nozzles with opposite charge were used. Electrospun nanofibers with opposite charges will attract each other and discharge through their path between nozzles. If one end of these discharged nanofibers is pulled out, a high bulky continuous mat of interlaced nanofibers will form.
The effects of some parameters such as applied voltage, nozzle distance and polymer concentration on diameter of electrospun PAN nanofibers by a modified method were evaluated. Average diameters of nanofibers increased with increasing applied voltage from 5 to 9 KV. Also increase in polymer concentration is accompanied with increase in fibers diameter. Results show increasing nozzle distance don't tend to any significant change the fibers diameter.
Productivity of electrospun nanofibers is compared with conventional electrospinning system. The productivity of electrospun nanofibers with new system is more than productivity of electrospun nanofibers with conventional system by 37.29%.

1. Introduction

ELectrospinning has been recognized as an efficient technique for the fabrication of nanofibres. Recently various polymers have been successfully electrospun into ultra fine fibres. Due to the small pore size and high surface area of electrospun nanofibres, they are used in many applications such as filtration, tissue engineering, sensor, composite, drug delivery, etc.[1] . In a typical process a high voltage is applied between a syringe needle and a grounded target. When the electric forces exceed a critical value, a charged fluid jet is ejected from the needle tip and very long nanofibers are collected on the grounded target. Nanofibers are often collected as randomly oriented structures in the form of nonwoven mat. Contact with grounded target causing creation of compact mat. Porosity of some nanowebs produced by this method is about 25-80%[3]. Bulky nanowebs with lower density (higher porosity) can be produced using a new method[4]. In this method despite of the conventional electrospinning system, two nozzles with opposite charge were used. Electrospun nanofibres with opposite charges will attract each other and discharge through their path between nozzles. If one end of these discharged nanofibres is pulled out, a high bulky continuous mat of interlaced nanofibres will form. These high bulky mats are useful for some applications such as fillers and thermal battings[5]. In this article the effects of some parameters including applied voltage, nozzle distance and polymer concentration on diameter of electrospun PAN nanofibers by a modified method were evaluated.

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