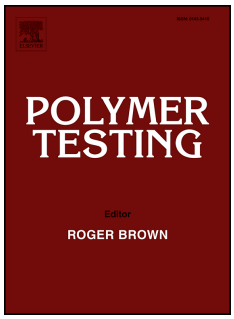
Accepted Manuscript



Towards predicting the piezoelectricity and physiochemical properties of the electrospun P(VDF-TrFE) nanogenrators using an artificial neural network

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PII: S0142-9418(17)31154-6

DOI: 10.1016/j.polymertesting.2018.01.010

Reference: POTE 5296

To appear in: *Polymer Testing*

Received Date: 14 August 2017

Revised Date: 28 December 2017

Accepted Date: 13 January 2018

Please cite this article as: M.M. Abolhasani, K. Shirvanimoghaddam, H. Khayyam, S.M. Moosavi, N. Zohdi, M. Naebe, Towards predicting the piezoelectricity and physiochemical properties of the electrospun P(VDF-TrFE) nanogenrators using an artificial neural network, *Polymer Testing* (2018), doi: 10.1016/j.polymertesting.2018.01.010.

Towards predicting the piezoelectricity and physiochemical properties of the electrospun P(VDF-TrFE) nanogenrators using an artificial neural network

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Abstract

Electrospun P(VDF-TrFE) nanogenrators with a wide range of piezoelectricity performance and physiochemical properties is fabricated through modification of the processing parameters such as polymer concentration, applied voltage, feed rate and electrospinning time/fibres mat thickness. In order to estimate and predict the relationships of the process parameters with the piezoelectricity performance and fibres morphology, an Artificial Neural Networks (ANN) model is developed. Results of the developed ANN model is found to be in a good agreement with experimental results with less than 5% error and shows the good potential to model physiochemical properties of the nanogenrators to predict untested conditions.

Keywords: Nanogenerator; Piezoelectricity; Artificial neural network; Nanofibre.

1. Introduction

Morphology of nanofibers fabricated by electrospinning is controlled by various factors and is dependent upon solution conductivity, viscosity, concentration, polymer molecular weight, applied voltage, feed rate, spinning distance, etc.[1-18]. Demir et al. [19] showed that the diameter of electrospun fibers increased at higher polymer concentration and Boland et al. [20]reported a linear relationship between diameter of electrospun fiber and polymer concentration. Chowdhury et al.[21]conducted experimental trials to investigate the influence of solution parameters, such as concentration and solvent effect, as well as processing