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Polyvinylidene Fluoride (PVDF) Microfibers Synthesized Using the High Voltage Electrospinning Technique

Abstract

Polymeric micro-fibrous materials are of high interest and are widely researched with applications in energy harvesting, biosensing, and micro devices. High voltage electrospinning is a material synthesis technique that can be utilized to produce polymeric fibers with controlled size, morphology, and crystalline structure. The electrospinning method leverages various experimental parameters such as the polymer solvent interactions, voltage, flow rate, and needle tip to collector distance. Polyvinylidene Fluoride (PVDF) is a chemically stable polymer that exhibits excellent piezoelectric, pyroelectric, and ferroelectric properties. PVDF crystalizes in four different crystalline phases (α, β, γ, and δ). The most desired phase is the β phase due to it exhibiting the highest levels of piezoelectricity. The electrospinning method can be utilized to "spin" PVDF fibers.

In this work, we investigate the effects on the synthesized microfibers by tuning the experimental parameters within the electrospinning system. Raman Spectroscopy and Scanning Electron Microscopy (SEM) characterization techniques will be conducted to analyze the specimen's crystallinity and morphology, respectively.

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