

Spinnability of Polyacrylonitrile-based nanofibers by sol-gel electrospinning process: blend and composite fibers

Polyacrylonitrile (PAN)-based electrospun nanofibers were attracted significant attention during the last several years as a simple and straightforward method to produce nanostructures, which are of interest in many applications. Such as filter materials, composite materials, biomedical applications (tissue engineering, scaffolds, health care, drug release systems), protective clothing, photoelectronic devices, photonic crystals and flexible photocells. The PAN-based nanofibers were prepared with series of polymer blend and polymer composite. 10 wt% PAN was prepared by dissolving PAN in DMF and stirring at room temperature for 12 h. A series of PAN/PVP blend and PAN/TiO₂ composite were prepared with 1-50 wt% of fillers (PVP and TTIP). The electrospinning process was performed by using a 10 mL syringe having a capillary tip which 0.2 mm inner diameter, the voltage is 7 kV, flow rate 1 mL/h and the distance between tip and collector is 15 cm. The morphology of PAN-based nanofibers was investigated by SEM and found the different between blend and composite fibers. Thermal properties such as thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC) also show the decreased thermal stability with increased fillers. Similarly, X-ray diffraction (XRD) and Fourier transform infrared (FTIR) measurements confirmed the decrease in crystallinity with the increase in fillers content.

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Track Classification: Material Physics, Nanoscale Physics and Nanotechnology