Functionalizations and Applications of Thermoplastic Nano-fibers and Nanofibrous Membranes

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Abstract

Different from electrospinning processes, a high throughput production process of making nanofibers and nanosized materials was developed in this laboratory. This process is specialized in production of thermoplastic nanofibers including polyester, polyolefin, and chemically modified polyolefins by melt extruding a blend of a thermoplastic polymer with a sacrificial cellulose acetate butyrate into regular size fibers using a co-rotating twin-screw extruder. The nanofibers were obtained by removing the cellulose acetate butyrate with acetone from the coarse fibers. The nanofibers were then easily dispersed in solutions and air-spray coated onto fibrous supporting materials to form nanofibrous membranes in controlled thickness, which can be directly employed in air and water filtration and purification applications. The nanofibrous membranes could be chemically modified with different functional moieties demonstrating unique and desired biological and chemical functions. This presentation will discuss structural features and properties of the membranes, as well as potential applications of the membranes as high efficient protein synthesis supports, biologically selective functional media, protein purifications, chemically active materials, and hierarchically structured nanomaterials.

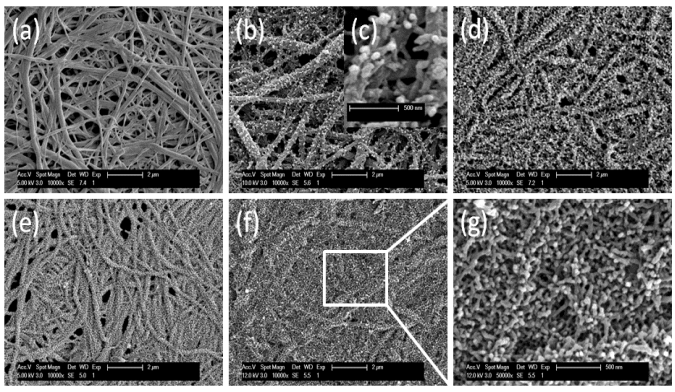

Figure 1 Hierarchically nanostructured materials from PU-co-GMA nanofiber membrane and PANI/PE-co-GMA nanofiber nanocomposite membranes prepared by in-situ polymerization

Keywords: Nanofibrous membranes; functional materials; biological separation and purification

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