

Investigation of Electrical, Thermal and Structural Properties on Polyacrylonitrile Nano-Fiber

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Abstract : Polymer composite nano-fibers including (1, 3 wt %) silver nano-particles have been produced by electrospinning method. Polyacrylonitrile/N,N-dimethylformamide (PAN/DMF) solution has been prepared and the amount of silver nitrate has been adjusted to PAN weight. Silver nano-particles were obtained from reduction of silver ions into silver nano-particles by chemical reduction by hydrazine hydroxide (N₂H₅OH). The different amount of silver salt was loaded into polymer matrix to obtain polyacrylonitrile composite nano-fiber containing silver nano-particles. The effect of the amount of silver nano-particles on the properties of composite nano-fiber web was investigated. Electrical conductivity, mechanical properties, thermal properties were examined by Microtest LCR Meter 6370 (0.01 mΩ-100 MΩ), tensile tester, differential scanning calorimeter DSC (Q10) and SEM, respectively. Also, antimicrobial efficiency test (ASTM E2149-10) was done against Staphylococcus aureus bacteria. It has been seen that breaking strength, conductivity, antimicrobial effect, enthalpy during cyclization increase by use of silver nano-particles while the diameter of nano-fiber decreases.

Keywords : composite polyacrylonitrile nanofiber, electrical conductivity, electrospinning, mechanical properties, thermal properties, silver nanoparticles

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