

Preparation of Conductive Composite Fiber by the Reduction of Silver Particles onto Hydrolyzed Polyacrylonitrile Fiber

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Abstract : Polyacrylonitrile (PAN) is one of the most common and cheap fiber-forming polymers because of its high strength and high abrasion resistance properties. The result of alkaline hydrolysis of PAN fiber could be formed the products with conjugated sequences of $-C=N-$, acrylamide, sodium acrylate, and amidine. In this study, PAN fiber was hydrolyzed in a solution of sodium hydroxide, and this hydrolyzed PAN (HPAN) fiber was used to prepare conductive composite fiber by silver particles. The electrically conductive PAN fiber has the usage potential to produce variety of materials such as antistatic materials, life jackets and static charge reducing products. We monitored the change in the weight loss values of the PAN fiber with hydrolysis time. It was observed that a 60 % of weight loss was obtained in the fiber weight after 7h hydrolysis under the investigated conditions, but the fiber lost its fibrous structure. The hydrolysis time of 5h was found to be suitable in terms of preserving its fibrous structure. The change in the conductivity values of the composite with the preparation conditions such as hydrolysis time, silver ion concentration was studied. PAN fibers with different degrees of hydrolysis were treated with aqueous solutions containing different concentrations of silver ions by continuous stirring at 20 oC for 30 min, and the composite having the maximum conductivity of 2 S/cm could be prepared. The antibacterial property of the conductive HPAN fibers participated silver was also investigated. While the hydrolysis of the PAN fiber was characterized with FTIR and SEM techniques, the silver reduction process of the HPAN fiber was investigated with SEM and TGA-DTA techniques. The SEM micrographs showed that the surface of HPAN fiber was rougher and much more corroded than that of the PAN fiber. Composite, Conducting polymer, Fiber, Polyacrylonitrile.

Keywords : composite, conducting polymer, fiber, polyacrylonitrile

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020