Muş Alparslan University

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ABSTRACT

Electrospinning is a unique method of producing polymer fibers because of the action of electrostatic forces on an electrically charged stream of polymer solution. This article presents the results of analyzes and experiments on the preparation of composite fibers based on polyacrylonitrile (PAN) and magnetite Fe_3O_4. For this purpose, magnetite nanoparticles were synthesized by the chemical condensation method. The synthesis of magnetite nanoparticles includes the preparation of solutions from iron (III) chloride with a concentration of 0.32 mol / L and iron sulfate with a concentration of 0.2 mol / L, by gradually adding a 25% aqueous ammonia solution. Analyzes of Fe_3O_4 magnetite nanoparticles have been carried out, according to the results of this analysis, that is, X-ray phase analysis and transmission electron microscopy (TEM), it is confirmed that the primitive deposition method can be used to synthesize

homogeneous Fe_3O_4 magnetite nanoparticles with particle sizes of 11-17 nm. The synthesized magnetite nanoparticles were used to obtain PAN/Fe_3O_4 composite fibers by adding magnetite in 7 wt. % PAN solution in dimethylformamide. Composite fibers were obtained from a suspension of PAN/Fe_3O_4 in dimethylformamide by electrospinning. Scanning electron microscopy (SEM) images show the fiber size being 288-658 nm. The conducted elemental analysis of PAN/Fe_3O_4 fibers showed a high carbon content - 65.95%. Comparison of PAN fibers 7 wt. % without the addition of magnetite and PAN/Fe_3O_4 fibers, leads to a decrease in the value of the fiber diameter that the addition of magnetite under equally equal conditions. The XRD analysis of PAN/Fe_3O_4 fibers was carried out, that magnetite nanoparticles in the composition of the fibers did not change their initial chemical composition and represent single-phase magnetite in a polymer matrix medium. The results obtained prove the possibility of obtaining composite PAN/Fe_3O_4 fibers based on magnetite by the electrospinning method.

Keywords: Electrospinning, magnetite nanoparticles, polyacrylonitrile, composite fiber.

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