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Nanoparticles of Silver loaded on polyaniline and Nylon

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ABSTRACT
Polyaniline and polyamide (nylon 6,6) nanocomposites with silver were prepared by in-situ oxidative polymerization of aniline monomers in the presence of Ag salt. Nano particles of silver (NPs) were synthesized by controlled reduction of Ag+ ions with sodium borohydride at room temperature. Nylon 6,6 was loaded with Ag nanoparticles by entrapment of Ag+ ions into the polymer network, followed by reduction. The nanocomposites were characterized by scanning electron microscopy (SEM), UV–Vis spectroscopy and FT-IR spectroscopy.

Keywords: Polyaniliae; Ag nanaparticles; Nylon6,6; Nanocomposite

INTRODUCTION
Until oow, several different approaches have been employed for the preparation of conducting polymer-metal and conducting polymer - inorganic particles nanocomposites, such as physical mixing [1], sol-gel technique [2], *in situ* chemical polymerization in the aqueous solution with the presence of polymer monomer and inorgaoic particles [3] emulsion technology and photolysis method [4].

Recently, noble metal nanostructures have attracted substantial interest due to their unique properties that arise from quantum confinement effects and interplay between surface and bulk effects. In particular, size and shape provide an effective strategy for tunning their physical and chemical properties, including luminescence, conductivity, and catalytic activity. Scientists have achieved excellent control over particle size for several spherical metal and semiconductor compositions, which has led to their use as probes for biological diagnostics, LED and Raman spectroscopy-enhancing materials. Yet the challenge of synthetically controlling particle shape remains open. Although some physical deposition, thermal, electrochemical and photochemical methods have been developed for making variously shaped semiconductor and metal nanoparticles, they usually yield relatively small quantities of the desired particle shape and are not eco-friendly [5]. It has been found that the novel materials exhibit improved mechanical, electrical and thermal properties due to the synergistic effect of the organic and inorganic components. Micro emulsion processing technique has been employed to fabricate various nanocomposite materials [6,7].

Polyaniline (PANI) has been extensively studied because of its facile synthesis, environmental stability, electrical, electrochemical and optical properties, and has found applications in antistatic and anticorrosion coatings, biological and chemical sensors, electrodes for light-emitting diodes and batteries [8]. Although the simplest method for the synthesis of bulk PANI is chemical oxidative precipitation polymerization of aniline (ANI) using a chemical oxidant such as an ammonium persulfate (APS), the resulting PANI is highly aggregated and therefore unsatisfactory for most applications. Industrial demand has led to the development of several strategies to overcome

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composite film there are a lot of small pores. The porous structures of the inner and outer layers are asymmetrical. From Fig. 3b which shows the PANI-SDS-Ag nanocomposite, we find that the Fe particles disperse uniformly in the polyaniline layer. Ag particles are dispersed on the framework of the porous structure, and the holes of the polyaniline layer.

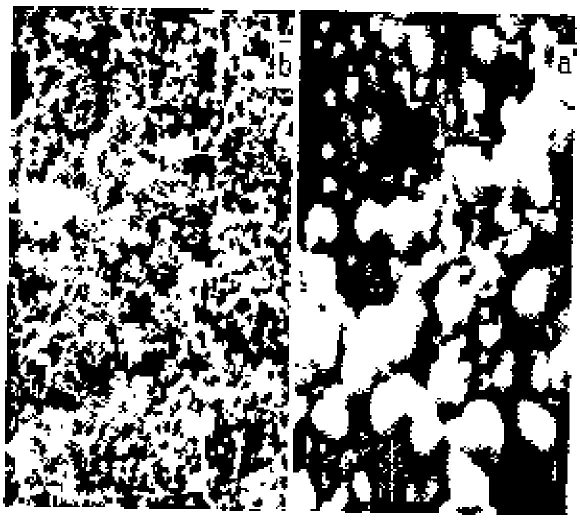

Fig. 3. SEM micrographs of the surface of pure polyaniline (a) and PANI-SDS-Ag(b).

Morphology of nylon 6,6 fabric and Ag loaded nylon 6,6 nanocomposite

In figure 4, the SEM image of synthesized nylon 6.6 fabric is shawn, which the smooth surface of nylon is obtained, and is ready to stabilize Ag particles. In figure 5, The Ag NPs synthesized on the polymer surface is shown, which 70 nm of Ag particles are formed on the surface.

Fig 4. SEM image of Nylon 6,6 surface.

Fig. 5. SEM image of Ag/ Nylon 6.6 nanocomposits

RESULTS AND DISCUSSION

Silver–Polyaniline nanocomposite has been synthesized emplaying the micro emulsion processing technique. The appearance af characteristic absorption bands around 310 and 425 in the UV–Vis spectra confirms the formation of conducting emeraldine salt (ES). The lower intensity polaron absorption for PANI-SDS-AgNan composites in the spectrum indicates that the doping state of the polymer has been impraved This method is simple, environmentally benign route for soluble polyaniline synthesis at room temperature and because there is no organic solvent used in this technique, so this can be called green synthesis.

CONCLUSION

Ag–Polyaniline nanocomposites is synthesized by *in situ* and employing the micro emulsion processing technique. The data and analysis of the FTIR and SEM shaw that PANI-SDS-Ag composite has a porous asymmetrical structure with a bi-layer where the inner layer comprises polyaniline and the outer layer is composed of SDS. The appropriate content af polyaniline in the composite is a key factor far preparing the PANI-SDS-Ag composite better performance. Also in summary, the fabrication procedure described in this report yielded a stable silver-nanocoated fabric in a very simple and cost effective manner. with camplete control of the silver loading level on the fabric.

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