

Synthesis and characterization of Fe₃O₄/PANI nanocomposites in suspension and their applications

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Nanocomposites of iron oxides and polyaniline (PANI) have been investigated because of their unique properties of each material hence applications are more efficient and versatile. Iron oxide magnetic nanoparticles (NPs) were synthesized and incorporated into a polymeric substrate that has conductive polyaniline properties. The ways that NPs are incorporated at for synthesis of nanocomposite (NP/PANI) can change rheological, electric or magnetic properties. In this study, iron oxide magnetic nanoparticles were synthesized by the co-precipitation approach, on an ultrasonic bath. These NPs were used for aniline polymerization in acidic media. For the (NP/PANI) synthesis, 10 g of the iron oxide nanoparticles were added to 6 mL of the aniline acidic solution [1]. This mixture was then subjected to one of the following procedures: ultrasound and heating, heating only, or ultrasound only. The materials were characterized by XRD, SEM and magnetization curve. The nanocomposite obtained has dark green color, characteristic of the conductive phase of polyaniline, and responds to an external magnetic field, confirming the presence of the NPs. Three different surfactants (oleic acid, sodium citrate, or sodium laurylsulfate) were then tested, with the goal of obtaining stable suspensions of the (NP/PANI) after 3 h in an ultrasonic bath. Oleic acid presented the best result, as only a very small fraction of the material settled and the suspension retained a dark-brown color during the experiments. The properties presented by these nanocomposites make them promising for applications in areas such as eletromagnetic devices, sensors and engineering.

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References:

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