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Synthesis of anisotropic defective polyaniline/silver nanocomposites

Vaishali Kamble[a], Gunjan Kodwani[a], Ramdoss Sridharkrishna and Balaprasad Ankamwar[*]

Bio-Inspired Materials Science Laboratory, Department of Chemistry, University of Pune, Ganeshkhind, Pune-411007, India

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Abstract. The chemical synthesis of anisotropic defective polyaniline/Ag composite (PANI/Ag) is explored using silver nitrate ($AgNO_3$) as the precursor material. This study provides a simple method for the formation of PANI/Ag nanocomposites at two different aniline concentrations 5μl (PANC5) and 10μl (PANC10). The composite PANC5 exhibits UV-Visible absorption peaks at 436 nm and 670 nm whereas, PANC10 exhibits absorption peaks at 446 nm and 697 nm. This shift is caused by the strong interaction between polyaniline and silver. The characterized FTIR peaks observed at around 3410 cm^{-1} (PANC5) and 3420 cm^{-1} (PANC10) was due to the N-H stretching vibrations. The appearance of a broad band instead of a sharp peak can be attributed due to the presence of a high concentration of N–H groups in the nanocomposite. The TEM images show that the sample contains defective spherical, truncated triangular and rod shaped particles. The results showed that the PANI/Ag nanocomposites are composed of nano-sized particles of 43-53 nm that contain Ag domains of 33-37 nm with polymer thickness 5.7-11.2 nm at two different aniline concentrations.

Keywords: silver nanoparticles; polyaniline; polyaniline-silver nanocomposites; trisodium citrate; polymer

1. Introduction

Materials with unusual combination of properties are required for enhancing technologies continuously. In order to obtain nanomaterials with determined functionality numerous efforts have been made in the last decades using novel nanotechnology and nanoscience knowledge. One such class of nanomaterial is the polymer nanocomposite which includes polymer matrices reinforced with nano-scale fillers, has revealed enhanced optical, electrical and dielectric properties. The incorporation of inorganic nanoparticles into a polymer matrix permits properties from inorganic nanoparticles and polymer to be enhanced and accordingly an advanced new function can be generated to the polymer–inorganic nanocomposites (PINCs) (Tamboli *et al.* 2012).

Conducting polymer exhibits tunable electrical, optical and magnetic properties. In comparison

∗Corresponding author, Associate Professor, E-mail: bgankamwar@chem.unipune.ac.in
[a]contributed equally

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