

Nanocomposite of Polyaniline with the Photoadduct of Potassium Hexacyanoferrate and Pyridine Ligand: Structural, Mechanical and Optical Study

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Abstract—This work involves the synthesis of polyaniline nanocomposite with photoadduct of potassium hexacyanoferrate and pyridine achieved through ball milling, photochemical route, and by oxidative polymerization technique using ammonium persulphate as oxidizing agent. The photoadduct has been synthesized by photoirradiation followed by substitution with pyridine ligand. The photoaddition, substitution and successful synthesis has been proved by recording pH, UV-visible spectra, FTIR and XRD. The as synthesized nanocomposite has been subjected to various characterization techniques like elemental analysis, UV-visible spectra, FTIR, XRD, and SEM. XRD of photoadduct shows crystalline structure which has been retained in the nanocomposites also. Parameters like crystallite size, dislocation density, microstrain, d-spacing, were evaluated. Thermal study was carried out by recording TGA/DTG, showing very high thermal stability of nanocomposite as compared to PANI which can be due to strong interaction between polymer chain and photoadduct, hence the material can be used for high temperature applications electrical conductivity was measured by four probe conductivity meter. Conductivity of nanocomposite was found to be many orders of magnitude higher than that of polyaniline. The nanomechanical properties were investigated with an MTS Nano-Indenter XP by using continuous stiffness measurement (CSM) technique. Mechanical properties of pure PANI has improved with doping of photoadduct.