Preparation and degradation of highly conducting polyaniline doped with picric acid

Seddique M. Ahmed

Abstract:

Preparation and characterization of highly conducting polyaniline (PANI) doped with picric acid (PA) was proved with the help of various techniques. Elemental analysis, FTIR and XPS spectroscopic measurements confirm that the PA operates as a protonating agent to induce the internal conversion of PANI emeraldine base (PANI-EB) to the PANI emeraldine salt (PANI-ES) with the doping level 50%. Molecular modeling calculations (MM+) showed that the optimum geometric structure of 2PA:1PANI (energy 38.231388 kcal/mol, and gradient 0.065246). The observed higher conductivity ($\sigma \approx 150$ S/cm) of PA-doped PANI film prepared at molar ratio 2PA:1PANI (EB) is attributed to the change in the molecular conformation from coil to expanded coil-like. PA-doped PANI is thermally unstable above 135°C and the thermal processing with other insulating matrix is not profitable but the solution casting is highly promising. PA-doped PANI with acrylonitrile-butadiene-styrene copolymer has been fabricated and showed the threshold value 4 wt.% of a conducting material. The reduced PA-doped PANI reveals an ability to store electrical energy of about 110.43 Wh/kg in a condensed lightweight form. The immediate decoloration of the dark green (kmax $\approx 815$ nm) PANI after addition of 5.5 lg/ml KMnO4 in strong acid medium (pH 1.0, H2SO4, 40% DMF) is due to the highest oxidized form of PANI. Increasing the absorbance with increases in the KMnO4 concentration (lg/ml) at $\lambda$385 nm has been successfully applied to the determination of trace amount (0.55 lg/ml) of Mn(VII) in a synthetic solution. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords:

Polyaniline; Picric acid; Conductivity; Electroactivity; Spectroanalytical; Degradation

Published In: