Journal of Basic and Applied Engineering Research
p-ISSN: 2350-0077; e-ISSN: 2350-0255; Volume 3, Issue 13; October-December, 2016, pp. 1218-1218

http://www.krishisanskriti.org/Publication.html

Electrical Conductivity and Thermal Stability of HNO_3 Doped Polyaniline and its Nanocomposites with Graphene, Carbon Nanotubes and Modified Carbon Nanotubes

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Abstract—*Here, we report one of the simplest approaches of electrically conductive HNO_3 doped polyaniline (Pani) nanocomposites with multiwalled carbon nanotubes (MWCNT), modified carbon nanotubes ($MWCNT^F$), and graphene (GN). These nanocomposites were prepared via in-situ oxidative polymerization of aniline by using $K_2S_2O_8$ as an oxidising agent. Furthermore, N-methyl-2- pyrrolidone (NMP) solvent was used for film casting of the prepared nanocomposites. The effect of polymerization and functionalization was characterized by Fourier transform infrared spectroscopy (FTIR), X-Ray diffraction analysis (XRD), Field emission scanning electron microscopy (FESEM). Results revealed the significantly increased the resultant electrical conductivity and stability which may be due to presence of $\pi-\pi$ interactions between Pani and carbon allotropes.*

The electrical properties of the as-prepared nanocomposites were investigated as a function of MWCNT and on the content of GN nanosheets in the nanocomposites. It was observed that as prepared nanocomposites showed greater electrical conductivity as well as improved thermal stability in terms of DC electrical conductivity under isothermal and cyclic ageing conditions.

Keywords:- *in-situ polymerization, Pani/MWCNT, Pani/$MWCNT^F$ and Pani/GN nanocomposite, isothermal and cyclic ageing technique.*