

Polypyrrole-zirconium(IV)SelenoiodateCation Exchange Nanocomposite: Synthesis, Characterization and its Application as a Formaldehyde Sensor

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Abstract—Polypyrrole-zirconium(IV)selenoiodate (PPy/ZSI) cation exchange nanocomposite has been synthesized by chemical oxidative polymerization of polypyrrole in the presence of inorganic entity zirconium(IV)selenoiodate by sol-gel method. The formation of PPy/ZSI nanocomposite was characterized by fourier transform infra-red spectroscopy (FTIR), x-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive x-ray (EDX), transmission electron microscopy (TEM) and thermogravimetric analysis (TGA). The ion exchange capacity of the nanocomposite was found to be 2.49 meqg^{-1} . Also, its electrical conductivity was determined by using a four-in-line probe and was measured to be 0.436 S cm^{-1} . The nanocomposite showed appreciable isothermal stability till 130°C in terms of DC electrical conductivity retention under ambient condition. In addition, the cation exchange nanocomposite based sensor for detection of formaldehyde vapors was fabricated at room temperature. It was revealed that the resistivity of the nanocomposite increases on exposure to higher percent concentration of formaldehyde at room temperature (25°C), also the sensor exhibited good reversible response towards formaldehyde vapors ranging from 5-7%. The present study may serve as a basis for designing other smart materials for formaldehyde sensors.

Keywords: Nanocomposite, polypyrrole, conductivity, formaldehyde, sensing.

