

ELECTRICAL PROPERTIES OF POLYANILINE -MONTMORILLONITE NANOCOMPOSITES

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The conductivity of an electronically conducting polymer depends on the arrangement of its chains. One way to improve the bulk properties of a polymer is to confine it in nanoscale environments. Nanocomposites are multiphase materials with two or more different compounds organized in nanometer regime and can show electronic, mechanical, magnetic properties that are not present in individual phases. *Ex situ* and *in situ* polymer based nanocomposites are prepared by intercalating organic monomer (anilinium ion) into the inorganic host structure (montmorillonite) and subsequent polymerization at room temperature (25 °C). Insertion of more polymer layers within the interlamellar spaces of montmorillonite is done by neutralizing the existing polymer layer and repeating the exchange of anilinium ions for interlayer cations followed by polymerization process without using alkylammonium ions of intercalating agent, cocamidopropylhydroxysultaine. Because of the isolation of the polymer chains from one another in the inorganic structure, FTIR (Fourier Transformed InfraRed) spectroscopy is used to characterize these types of systems. The increment of the infrared band intensities of benzenoid ($\bar{\nu}=1600\text{ cm}^{-1}$), quinoid ($\bar{\nu}=1500\text{ cm}^{-1}$) and C-N ($\bar{\nu}=1306\text{ cm}^{-1}$) show the increase of the polymer within the interlayers of clay.

The DC conductivities of these *ex situ* and *in situ* polyaniline/montmorillonite nanocomposites are increased as the successive introduction of polyaniline chains within the inter-layer galleries of montmorillonite. However, the conductivity of *ex situ* polyaniline/montmorillonite nanocomposite is higher than that of *in situ* nanocomposite. Mass of the clay influences greatly on the formation of conducting form of polyaniline of these classes of materials. When the mass of clay of *ex situ* nanocomposite is increased, the band at 1110 cm^{-1} , which is attributed to the B-NH⁺-Q, disappears with a concomitant reduction of the conductivity. The X-ray diffraction pattern of *ex situ* polymerization did not show distinct peaks, suggesting that the clay particles dispersed chaotically in the polymeric structure.

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