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Synthesis, Characterisation and Study of Dielectric Behaviour of PANI/$[Co(NH_3)_3(C_4H_4N_2)_3]Cl_3$ Composite

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ABSTRACT

In this study we have synthesised polyaniline/$[Co(NH_3)_3(C_4H_4N_2)_3]Cl_3$ composite by in-situ chemical polymerisation method in non-aqueous dimethyl sulphoxide medium. The filler photoadduct was synthesised by irradiating aqueous solution mixture of hexaminecobalt(III) chloride metal complex and pyrazine, which was subsequently reduced in size by high energy ball milling prior to incorporation into the polyaniline matrix. FTIR and XRD results show presence of photoadduct nanoparticles in the polyaniline matrix and successful interactions between them, with photoadduct retaining its structure in the composite. Presence of modified agglomerate regions in composite have been confirmed from FESEM which facilitates better charge separation in the material as observed from dielectric measurements. The dielectric measurements (έ, ε̋ , tanδ and σ_{ac}) were studied as a function of frequency and their variation with frequency is explained by "Maxwell-Wagner" model. The composite shows higher value of dielectric constant (10^6) and higher value of ac-conductivity (10^9) as compared to pure PANI. The high value of dielectric constant and ac-conductivity of the nanocomposite makes the material suitable for energy storage applications and an effective electromagnetic interference shielding material both at low and high frequency.

Keywords: polyaniline (PANI), photoadduct (PA), nanocomposite, dielectric measurement, irradiation