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Study of Thermal, Electrical and Optical Properties of Polyaniline Composite with Photosubstituted $[Co(NH_3)_4(C_3H_4N_2)_2]Cl_3$ Metal Complex

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Abstract—*A new polyaniline/$[Co(NH_3)_4(C_3H_4N_2)_2]Cl_3$ composite was synthesised by in-situ oxidative polymerisation of aniline monomer in non-aqueous DMSO medium. The composite was characterised by techniques like UV-Vis spectroscopy, Fourier transform infrared spectroscopy (FTIR), X-ray diffraction analysis (XRD) and field emission scanning electron microscopy (FESEM). The results revealed presence of photoadduct in composite with significant interaction between PANI matrix and photoadduct particles. The composite exhibit enhanced thermal stability broadening its scope of usability. The better dispersion of photoadduct particles in the PANI matrix as observed in FESEM, facilitates better charge transport. The composite was investigated as a suitable material for energy storage and high frequency device applications due to its high value of dielectric constant ($\approx 10^4$) and ac-conductivity ($\approx 10^8$) with a rapid decrease in loss tangent in the high frequency region. The high value of dielectric constant and ac-conductivity of composite is attributed to the heterogeneous structure of composite with enhanced interface, which has a positive effect on the dielectric properties of the material.*