

Flexible PVC Based Nanocomposites With the Incorporation of Electric and Magnetic Nanofillers for the Shielding Against EMI and Thermal Imaging Signals

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Abstract : Electromagnetic (EM) waves are being used widely now a days. Cell phone signals, WIFI signals, wireless telecommunications etc everything uses EM waves which then create EM pollution. EM pollution can cause serious effects on both human health and nearby electronic devices. EM waves have electric and magnetic components that disturb the flow of charged particles in both human nervous system and electronic devices. The shielding of both humans and electronic devices are a prime concern today. EM waves can cause headaches, anxiety, suicide and depression, nausea, fatigue and loss of libido in humans and malfunctioning in electronic devices. Polyaniline (PANI) and polypyrrole (PPY) were successfully synthesized using chemical polymerizing using ammonium persulfate and DBSNa as oxidant respectively. Barium ferrites (BaFe) were also prepared using co-precipitation method and calcinated at 1050°C for 8h. Nanocomposite thin films with various combinations and compositions of Polyvinylchloride, PANI, PPY and BaFe were prepared. X-ray diffraction technique was first used to confirm the successful fabrication of all nano fillers and particle size analyzer to measure the exact size and scanning electron microscopy is used for the shape. According to Electromagnetic Interference theory, electrical conductivity is the prime property required for the Electromagnetic Interference shielding. 4-probe technique is then used to evaluate DC conductivity of all samples. Samples with high concentration of PPY and PANI exhibit remarkable increased electrical conductivity due to fabrication of interconnected network structure inside the Polyvinylchloride matrix that is also confirmed by SEM analysis. Less than 1% transmission was observed in whole NIR region (700 nm - 2500 nm). Also, less than -80 dB Electromagnetic Interference shielding effectiveness was observed in microwave region (0.1 GHz to 20 GHz).

Keywords : nanocomposites, polymers, EMI shielding, thermal imaging

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