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Polyvinylidene Fluoride-Polyaniline Films for Improved Dielectric Properties

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Abstract : Polyvinylidene fluoride (PVDF) is a well-known material for remarkable mechanical properties, resistance to chemicals and superior ferroelectric performances. This endows PVDF the potential for application in supercapacitor devices. The dielectric properties of PVDF, however, are not very high. To improve the dielectric properties of Polyvinylidene fluoride (PVDF), Piezoelectric polymer nanocomposites are prepared without affecting the other useful properties of PVDF. Polyaniline (PANI) was chosen as a filler material to prepare the nanocomposites. PVDF-PANI nanocomposite films were prepared using solvent cast method with different volume fractions of PANI varying from 0.04% to 0.048% of PANI content. The films are characterized for structural, mechanical, and surface morphological properties using X-ray diffraction, differential scanning calorimeter, Raman spectra, Infrared spectra, tensile testing, and scanning electron microscopy. The X-ray diffraction analysis shows that, prepared films were in β-phase. The DSC scans indicated that the degree of crystallinity in PVDF-PANI is improved. Raman and Infrared spectrum further confirm the presence of β-phase of PVDF-PANI film. Tensile properties of PVDF-PANI films were in good agreement with those reported in literature. The surface feature shows that PANI is uniformly distributed in PVDF and also results in disappearance of spherulites. The influence of volume fraction of PANI in PVDF on dielectric properties was analyzed. The results showed that the dielectric permittivity of PVDF-PANI (120) was much higher than that of PVDF (12). The sensitivity of these films was studied on application of a pressure and a constant output voltage was obtained.

Keywords : dielectric Properties, PANI, PVDF, smart materials
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