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Phase Transformation, Surface Morphology and Dielectric Property of P(VDF-HFP)/$MgCl_2$•$6H_2O$ Nanocomposites

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Nanocomposite piezoelectric films based on the blend of poly(vinylidenefluoride-hexafluoropropylene) (PVDF-HFP) and magnesium chloride hexahydrate ($MgCl_2$•$6H_2O$) have been investigated in this work. The films incorporated with 0.5 wt% $MgCl_2$•$6H_2O$ were prepared using a solution casting technique and uniaxially stretched at various ratios from 2 to 6 times in order to characterize phase transformation, surface morphology and dielectric behavior. The piezoelectric β phase transformation and crystallinity of the stretched films were identified by Fourier transform infrared spectroscopy (FTIR) and X-ray diffraction (XRD). A scanning electron microscopy (SEM) was conducted to observe the surface microstructure and porosity. The frequency dependence of dielectric properties was also measured by LCR meter at room temperature. The stretched films show the larger the stretching ratio, the greater the microdefects appear. This leads to a decrease of dielectric constant with stretching ratio. Nevertheless, the P(VDF-HFP) nanocomposites with stretching ratio of 4 times display a higher β phase fraction of 90% than the unstretched films. Thus, this result points out that the β phase transformation of the composite films can be enhanced by mechanically stretching process.

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