Preparation and Characterization of Ferroelectric Polymer Nanocomposites

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The electrocaloric effect (ECE) refers to the conversion of thermal to electrical energy of polarizable materals, which have potentiality to substitute traditional vapor compression refrigeration, owing to their environment-friendly and energy-efficient cooling methods. Ferroelectrics can generate bulky and spontaneous polarization to produce isothermal entropy change (ΔS) or adiabatic temperature change (ΔT) under an external electric field.

In this paper, P(VDF-TrFE-CFE) terpolymer films with a composition of 6/2/2 mol% and the terpolymer incorporated $Ba_{0.6}Sr_{0.4}TiO_3$ (BST) nanocomposites were prepared by a casting method. The effects of crystallization temperature and volume of nanopowders on structures and ferroelectric properties of polymer nanocomposites have been investigated. Results show that the optimized crystallization temperature and volume of nanopowders are of 140 ^{o}C and 10 vol% respectively, by comparing the phase structure, dielectric and ferroelectric properties of composite films. ΔT of polymer films and polymer nanocomposite films achieve about 10.2 ^{o}C and 12.6 ^{o}C, respectively, under the electric field of 100 MV/m revealing the obvious elecctrocaloric effect.