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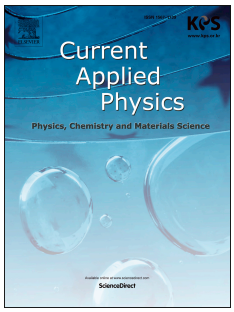

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Investigation on crystalline structure and dielectric relaxation behaviors of hot pressed poly(vinylidene fluoride) film

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Abstract

The dielectric relaxation behaviors of hot pressed poly(vinylidene fluoride) (PVDF) film have been studied using dielectric spectroscopy in the frequency domain from 20 Hz to 5 MHz at temperatures between 20□ and 200□. Crystalline/amorphous interphase is suggested with methods of FTIR, XRD, and DSC. Frequency and temperature dependence of dielectric spectroscopy reveals the relaxation behavior and structural dynamics of the samples, and three types of relaxation processes are suggested, α_{Ac} relaxation process contributed by the hopping transport process near the periphery of conduction band or valence zones at Fermi energy, α_c relaxation process related to the structure change of crystal lattice trapped dipoles in crystalline regions, and α_a relaxation process arising from segmental dipole rearrangement of interphases in amorphous regions. Cole-Cole and Havriliak-Negami experimental equations were utilized to analyze these relaxation processes, and differences of Arrhenius parameters for α_{Ac} and α_c relaxation processes obtained from Cole-Cole and Havriliak-Negami equations were discussed in detail. Activity energy of different relaxation processes obtained from Arrhenius equation and VFT equation indicates non-single thermal activation mechanism for hot pressed PVDF film.

Keywords: Poly(vinylidene fluoride); Dielectric relaxation; Crystalline structure; Interphases; Ac conductivity