

Accepted Manuscript

P(VDF-HFP)/PMMA flexible composite films with enhanced energy storage density and efficiency

Bingcheng Luo, Xiaohui Wang, Hongxian Wang, Ziming Cai, Longtu Li



PII: S0266-3538(17)31336-2

DOI: [10.1016/j.compscitech.2017.08.013](https://doi.org/10.1016/j.compscitech.2017.08.013)

Reference: CSTE 6868

To appear in: *Composites Science and Technology*

Received Date: 2 June 2017

Revised Date: 20 July 2017

Accepted Date: 12 August 2017

Please cite this article as: Luo B, Wang X, Wang H, Cai Z, Li L, P(VDF-HFP)/PMMA flexible composite films with enhanced energy storage density and efficiency, *Composites Science and Technology* (2017), doi: 10.1016/j.compscitech.2017.08.013.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

P(VDF-HFP)/PMMA Flexible Composite Films with Enhanced Energy Storage Density and Efficiency

Bingcheng Luo,¹ Xiaohui Wang,¹ Hongxian Wang, Ziming Cai, Longtu Li¹

¹State Key Laboratory of New Ceramics and Fine Processing, School of Materials Science and Engineering, Tsinghua University, Beijing 100084, PR China

Abstract: P(VDF-HFP)/PMMA composite films were fabricated using a blending and hot-molding method and investigated using both experimental and theoretical methods. The extended Flory–Huggins model were adopted to study the Gibbs energy, miscibility, and phase composition of binary mixture, and results showed favorable interactions and compatibility between P(VDF-HFP) and PMMA. The dielectric constant and loss of blend films were reduced compared to pristine films. The ferroelectric hysteresis loops of blend films are much slimmer than that of pristine P(VDF-HFP) films. The discharged energy density of 11.2 J/cm³ with the efficiency of 85.8% was obtained in the P(VDF-HFP)/PMMA blend films with 42.6 vol% PMMA at the electric field of 475 MV/m. The discharged energy density of blend film is 2.6 times of that of pristine film, while the energy storage efficiency is 2.07 times higher than that of pristine film. The origin of enhancement in the dielectric energy storage properties were analyzed using Fourier transform infrared spectra and atomistic simulation. FT-IR results showed γ -phase of P(VDF-HFP) was induced in blend films with a relative amount of 93.6%, comparing with the pristine P(VDF-HFP) films. The van der Waals forces and hydrogen bonding at the interface and the chain entanglement were responsible for the miscibility and stabilization of γ -phase, strengthening the energy storage properties.

Download English Version:

<https://daneshyari.com/en/article/5022285>

Download Persian Version:

<https://daneshyari.com/article/5022285>

[Daneshyari.com](https://daneshyari.com)