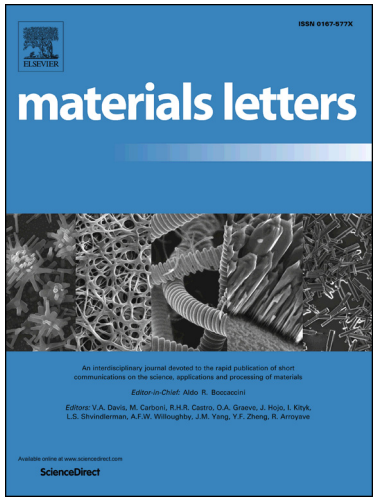

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PII: S0167-577X(18)30511-1
DOI: https://doi.org/10.1016/j.matlet.2018.03.139
Reference: MLBLUE 24100

To appear in: *Materials Letters*

Received Date: 7 February 2018
Revised Date: 14 March 2018
Accepted Date: 21 March 2018

Please cite this article as: P. Qu, X. Liu, S. Wang, C. Xiao, S. Liu, Moderate dehydrofluorinated PVDF with high energy density, *Materials Letters* (2018), doi: https://doi.org/10.1016/j.matlet.2018.03.139

Moderate dehydrofluorinated PVDF with high energy density

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Abstract

Moderate dehydrofluorinated PVDF (MD PVDF) composed of polyene and untreated PVDF was produced by elimination reaction in polyvinyl pyrrolidone (PVP) and KOH aqueous solution. Dielectric films of MD PVDF were fabricated by solution casting method to study the energy density performance of the polymer. The energy density of MD PVDF was enhanced and the maximum energy density was 10.5J/cm^3 at 450kV/mm with an efficiency of 46%. The enhanced energy density was attributed to combined effects of high conductivity of polyene and charges blockage of untreated PVDF. This work may provide a new way to enhance the energy density performance of polymer dielectrics by moderate dehydrofluorination.

KEY WORDS: Dielectrics; Polymers; Moderate dehydrofluorinated PVDF; Energy density; Polyene; Untreated PVDF.

1. Introduction

With the rapid development of electric and electronic industry, huge demands for progressive electric energy-storage systems and advanced energy-storage materials are needed.[1,2] Compared with other electrical energy-storage devices, capacitors have superiority in fast charge-discharge capability, high power density and long lifetime.[3] However, their energy densities are at least an order of magnitude lower than that of other electrochemical devices, such as batteries and double-layer supercapacitors. As a result, dielectric materials with high energy density and light weight are highly desirable.[4,5]

The energy density of dielectric materials can be described by the integral:

$$U_e = \int E dD \tag{1}$$

Where U_e is the energy density, E is the electric field and D is electric displacement at the electric