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THE INFLUENCE ON SOLVENT FOR ELECTROACTIVE PHASE FORMATION IN POLY VINYLIDENE FLUORIDE) FILM PREPARATION

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ABSTRACT

This work is aimed to study the influence of the electroactive phases (α-, β- and γ-phases) of a poly (vinylidene fluoride) (PVDF) film using few selective solvents, *e.g.*, dimethylformamide (DMF), dimethylacetamide (DMAc), dimethylsulfoxide (DMSO) and Methyl-2-pyrrolidone (NMP). The main emphasis is paid on critical analysis of electroactivephases formation depending on selective solvents. The crystallographic phase identifications are carried out by Fourier transform infrared spectroscopy (FT-IR). It indicates that the yield of electroactive phases is also depends on the type of the solvents regardless of other parameters. In addition, it has been also found that surface morphology of the PVDF films are greatly affected in different solvent systems and thus the electrical properties. The dielectric study also revelling that when DMAc solvent is used dielectric loss is lowest among other films.

Keywords: Electroactive phases, PVDF, selective solvents. Dielectric constant and loss

INTRODUCTION

Polymer-based thin film electronics is a pioneering technology in which the electroactive polymers are used as smart materials for constructing electronic devices such as memory elements, sensors, actuators, energy harvesters, power storage materials and functional biomaterials [1]. Poly (vinyl dine fluoride) (PVDF) is one of the versatile electoactive semi-crystalline polymer due to its flexibility, chemical resistive properties, excellent switching characteristics and different crystalline polymorphs ($\alpha, \beta, \gamma, \delta$) [2].The $\beta(TTTT$ conformation) and γ ($T_3GT_3\bar{G}$conformation)-crystalline phases are the focus of interest due to their polar electroactive conformations, whereas α (*TGTG* conformation)-phase is non-electrically active. It is widely accepted that electroactive phases in PVDF give raise to the ferroelectric behaviour and exhibit piezoelectric and pyroelectric properties upon electrical poling. In this work we study the influence of the electroactive phases (α- and γ- phases) of a poly (vinylidene fluoride) (PVDF) film using few selective solvents, *e.g.*, N,N-dimethylformamide (DMF), N,N-dimethylacetamide (DMAc), N,N-dimethylsulfoxide (DMSO) and N, N-Methyl-2-pyrrolidone (NMP). It has been observed that increasing casting temperature can enhance the yield of electroactive phases up to a certain level and then diminishes for most of the solvents.