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Electroactive tape extrusion: influence of processing conditions on the β -phase content of PVDF samples

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Poly(vinylidene fluoride), PVDF, in its polar β -phase, is known to possess strong piezoelectric properties, among polymers. The α phase of PVDF is the most stable phase when the polymer crystallizes from the melt. In this way, the electroactive phase of the material is commonly obtained by inducing the α to β phase transformation through mechanical stretching at a given temperature, being the stretch ratio and temperature the most important parameters influencing the phase transformation [1]. Further, it has been demonstrated that the electroactive response of the material strongly depends on the β -phase and therefore on the processing conditions [2]. In the present work, the effect of processing variables in the content of β -phase PVDF extruded tape, namely the stretching ratio and process temperatures, was studied. For comparison purposes the produced samples were uniaxially stretched with ratios of up to 6, in the extrusion line (in-line) and in a tensile tester (off-line), at both 80°C and 120°C. The β -phase content was analysed by Fourier transform infrared spectroscopy (FTIR) and the electroactive phase content was correlated to the electroactive response of the material, obtained through the measurement of the d33 piezoelectric coefficient. The results obtained allowed to identify the most important parameters influencing the amount of the β -phase content and will be used as guidance for the development of a large scale production process for multilayer products with piezoelectric properties.

Acknowledgement: The authors acknowledge FCT- Portuguese Foundation for Science and Technology through the project PTDC/CTM/108801/2008 and FEDER via FCT, Fundação para a Ciência e Tecnologia, under the POCI 2010 and Pluriannual programs.

Keywords: electroactive; tape extrusion; PVDF

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Published: JUN 2010.