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VI International Materials Symposium MATERIAIS 2011 (XV meeting of SPM – Sociedade Portuguesa de Materiais)
Guimarães, Portugal, 18-20 April 2011

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Production of electroactive filaments by coextrusion

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The development of new products for i-textiles (interactive textiles) or e-textiles (electronic textiles) applications shows a significant growth in the most recent years due to their huge potential. Although much scientific work has been published in the last years, actual practical applications are still limited. This is due, on one hand, to unsatisfactory state of development of the technology and, on the other, to difficulties on the integration of technologies and methods of the textile and electronic areas.

Products for e/i-textiles very often involve the use of sensors, preferably in the form of films, filaments or fibres, due to the inherent easy insertion in the product. For this purpose, electroactive filaments, that benefit from the piezoelectric properties of poly(vinylidene fluoride), PVDF, can be an interesting choice.

There aresome works published in the literature related to the development of films with piezoelectric properties [1], that employ PVDF as the electroactive material. However, despite its importance, the manufacture methodologies employed are very difficult to use in industrial scale production.

In this work a novel methodology for the production of electroactive filaments, by coextrusion of PVDF and an electrical conductive polymer composite, is proposed and tested. The developed methodology involves a conventional coextrusion line, and can be easily scaled up for industrial massive production. It is shown that The PVDF filament with a conductive PP/carbon black composite core crystallizes in the crystalline phase related just to the temperatures and stretch ratio conditions, independently of the existence of the conductive core: for 80ºC the material crystallizes in the α-phase and undergoes increasing α to β phase transformation for increasing stretch ratios from 1 to 5.

Acknowledgement: The authors acknowledge **FCT-** Portuguese Foundation for Science and Technology through the projects PTDC/CTM/69316/2006, NANO/NMed-SD/0156/2007 and PTDC/CTM/108801/2008 and FEDER via FCT, Fundação para a Ciência e Tecnologia, under the POCI 2010 and Pluriannual programs. A.F., P.C. and V. S. thank the FCT grants SFRH/BD/69796/2010, SFRH/BD/64267/2009 and SFRH/BPD/63148/2009.

Keywords: i/e-textiles ; electroactive filaments; coextrusion

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