Monofilament Composites of Co-continuous Polyamide12/Poly (Methyl Methacrylate) and Carbon Nanotubes

J.A. Covas, B.A. Oliveira, M.F. Barbosa, M.C. Paiva

Institute for Polymers and Composites/I3N, University of Minho, 4800-058 Guimarães, Portugal

Polymer-polymer/carbon nanotube (CNT) composite fibres with a co-continuous morphology were developed, aiming at structural and functional applications. The objective was to produce fibres with electrical conductivity, provided by the incorporation of CNT, maintaining the mechanical properties at a level that allowed typical textile processing. If this goal is achieved, then the fibres may be incorporated into a fabric at specific locations, and be used for sensing purposes.

The present work reports the processing of co-continuous bi-polymer CNT composites and the production of mono-filaments with a range of drawing ratios. The composites were processed by melt mixing in a twin-screw extruder. Polyamide 12 (PA12), Poly(methylmetacrylate) (PMMA) and CNT were blended at 78:18:4 weight ratios, incorporated at various positions along the extruder barrel. The CNT remained in the PA12 phase, irrespective of the polymer order of admission in the extruder. In order to achieve electrical conductivity in the CNT/polymer blend a double percolation has to be attained [1], meaning that the polymer bearing the CNT has to be continuously distributed along the fibre, and the CNT dispersed inside that polymer have to form a conductive network. Monofilaments were drawn, their morphology and electrical conductivity were studied. Electrically conductive monofilaments were produced, even at the higher drawing ratios tested.

[1] S. Bose, A. R. Bhattacharyya, P. V. Kodgire, A. Misra, P. Potschke, J. Appl. Poly. Sci., 106, 3394 (2007).

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