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Oral presentation ☒

FUNCTIONALIZED CARBON NANOTUBES-POLYAMIDE COMPOSITES PRODUCED BY MICROINJECTION MOULDING

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Introduction

Polymer composites containing carbon nanotubes (CNT) have attracted much attention due to the possibility to obtain electrically conductive and reinforcing materials at relatively low CNT concentrations, and for their potential applications in electronics, and chemical and biological sensing.

Microinjection molding (μIM) is an emerging efficient and cost-effective process for the large-scale production of thermoplastic nanocomposite microparts.

The present work reports the dispersion of CNT in polyamide 6 (PA 6) for the production of nanocomposites with different amounts of functionalized and non-functionalized CNT. The nanocomposites were microinjection molded under specific conditions and the electrical and mechanical properties of the specimens obtained were measured.

Experimental

CNT NT 7000 from Nanocyl were functionalized using the 1,3-dipolar cycloaddition reaction of an azomethine yilide, generating pyrrolidine groups at the CNT surface [1], under solvent-free conditions.

The PA 6 nanocomposites with 1%, 1,5%, 3% and 4,5% of pure or functionalized CNT were prepared in a prototype mini-twin screw extruder under different processing conditions; small specimens were obtained by microinjection moulding in a Boy 12 equipment (Fig. 1).

Fig. 1 – Small size of specimens

The nanotube agglomerate size, distribution and dispersion were measured using optical microscopy (OM), and the CNT/polymer interface was observed by scanning electron microscopy (SEM). The electrical resistivity and mechanical properties of the composites were measured.

Results

The images of the composites obtained by OM allowed the statistical study of CNT agglomerate size and distribution. The SEM images evidence the effect of the chemical modification of the CNT, illustrating the improvement of the CNT interface in PA 6 for the funcionalized CNT that affected the electrical and mechanical properties of the composites.

Acknowledgement: The authors acknowledge the financial support from FCT through project POCI/QUI/59835/2004 and the PhD grant to T. Ferreira (SFRH/BD/39119/2007).

Keywords: cartbon nanotubes; functionalization; microinjection moulding; electrical conductivity.

References

[1] - M. C. Paiva, F. Simon, R. M. Novais, T. Ferreira, M. F. Proença, W. Xu, F. Besenbacher, "Controlled Functionalization of Carbon Nanotubes by a Solvent-free Multicomponent Approach" *ACS Nano*, accepted for publication.