Microinjection moulding of polyamide with functionalized carbon nanotubes

Tânia Ferreira, Andrea Cunha, Maria C. Paiva, António J. Pontes

Institute for Polymers and Composites, Department of Polymer Engineering, University of Minho, 4800-058 Guimarães, Portugal.
e-mail: mcpaiva@dep.uminho.pt

Chemical modification of carbon nanotubes is an approach used to overcome the problem of dispersion and interfacial bonding with different materials. In this work, the nanotubes were functionalized using the 1,3-dipolar cycloaddition reaction, that generate pyrrolidine groups on the nanotubes surface, as summarized in the following scheme.

![Chemical modification scheme](image)

The nanotubes were mixed with polyamide 6 in a prototype mini-twin screw extruder. The composite was injection moulded into small specimens (Figure a) using a microinjection moulding machine Boy 12. The nanotube agglomerate size and distribution was measured, as well as the electrical and mechanical properties. The functionalized nanotubes presented a better interface with the matrix polymer compared to non-modified nanotubes, as depicted in Figure b and c.

![Composite specimens and micrographs](image)

**Figure:** a) injection moulded composite specimens and: scanning electron micrographs of b) cross-section of the composite formed with 3 wt% non-functionalized CNT, c) cross-section of the composite formed with 3 wt% functionalized CNT.

**References**

**Acknowledgements:** 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).