EuroSciCon

Morphology/performance relationship of polymer based nanocomposite pieces obtained by injection molding

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Abstract

Polymer nanocomposites are materials that have great potential in a variety of applications. By incorporating nanoscale particles of a filler material, the performance and properties of the bulk material can be drastically altered. Indeed, quite exceptional improvements can be achieved with small amounts of filler. To make nanocomposites economically viable, i.e. use them in massive applications, their production must use common processing equipment, and additional processing steps should be avoided. Many thermoplastic-composites are processed by an injection moulding process. It is generally accepted that the performance of polymer nanocomposites is intimately related to the degree of dispersion of the nanofiller: good dispersion and exfoliation may lead to the expected improvement in properties. This dispersion depends on factors such as the affinity and compatibility of the filler with the matrix, the matrix viscosity and the applied thermo-mechanical level, which depends on the processing conditions. The understanding of the fracture, microdeformation and mechanics of failure of nanocomposites is crucial for engineers. In this work the relationship between processing and performance is reviewed for different injected thermoplastic pieces. The combined effects of the moulding technique and the nano filler on the properties of the polymer composites are reported. Also, the effect of the occurrence of in-homogeneities, such as weld lines or flow lines in microstructure and therefore in performance are summarized.

Keywords— *Carbon nanotubes, Injection molding, Nanoclay, Polymer.*

Professional Biography

VALERIA PETTARIN was born in Argentina in 1974. She graduated in Materials Engineering (1998) and received her PhD in Material's Science (2002) at the University of Mar del Plata. She is currently working as a Researcher at Institute of Materials Science and Technology in the Polymer Science and Engineering Group, and as Professor at University of Mar del Plata. She has made several research stays at high level research institutions from Italy, Brasil, Portugal and Germany. Her research interests lie on the experimental characterization and numerical simulation of mechanical, fracture and impact performance of polymer parts and its relationship with microstructure induced by the processing technology. She authored 35 indexed and 6 non indexed scientific publications, 6 book chapters and more than 100 works at International Conferences. She has also led several national and international research projects, and supervised several undergraduate, doctoral and pos-doctoral students.



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