

Polymer / Graphene Oxide Nanocomposites: Investigating the Effect of the Interfacial Interactions on Structure and Properties

I. Karnis ^{1,2*}, F. Krasanakis ¹, A. N. Rissanou ¹, K. Chrissopoulou ¹

¹*Institute of Electronic Structure and Laser, Foundation for Research and
Technology Hellas, Heraklion, Crete, Greece*

²*Department of Chemistry, University of Crete, Heraklion Crete, Greece*

K. Karatasos ³

³*Department of Chemical Engineering, Aristotle University of Thessaloniki,
Thessaloniki, Greece*

Polymer nanocomposites have been in the focus of interest of the research community due to their improved properties compared to the ones of the pure polymers. In this work, nanohybrids which consist of hyperbranched polymers of different generation and graphene oxides (GO) with different degree of oxidation were developed in a broad range of compositions to investigate the effect of the varying polymer/GO interactions on the final material structure and properties. Initially, the change of the GO oxidation degree was achieved by altering either the oxidation time or the mass of the oxidation agent, however it is only the latter that is found to play a role on the hybrid structure. Subsequently, nanohybrids were synthesized utilizing hyperbranched polyester polyols and the GOs with varying oxidation degrees. A gradual change from a phase separated to a fully intercalated structure was obtained using X-ray diffraction (XRD), as shown in Figure 1. Moreover, Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA) measurements revealed that the nanohybrids thermal properties were affected by the nanocomposite structure as well as the composition since there is a significant effect on the thermal transitions, the thermal stability of the polymer and on the reduction temperature of the GO.

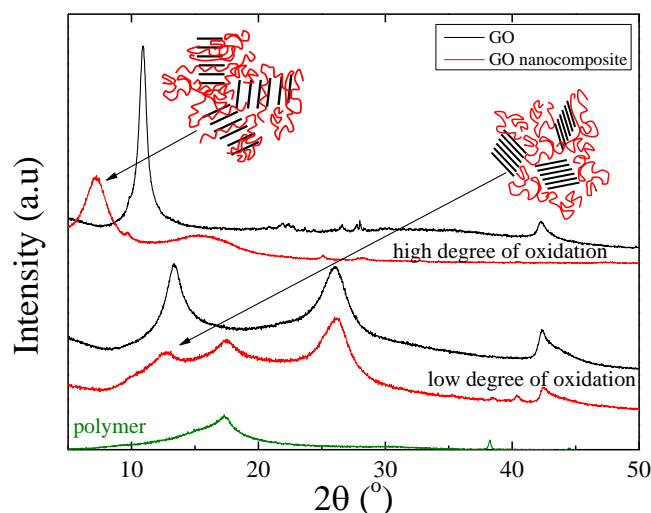


Figure 1: X-ray diffraction measurements of nanohybrids composed of GO of different degree of oxidation. The neat materials are shown as well.

Acknowledgements

This research has been co-financed by Greece and the European Union (European Social Fund- ESF) through the Operational Programme «Human Resources Development, Education and Lifelong Learning 2014-2020» in the context of the project "POLYGRAPH" (MIS 5050562).

*gkarnis@iesl.forth.gr