



ΙΤΕ/ΙΕΧΜΗ

ΠΡΟΣΚΕΚΛΗΜΕΝΗ ΟΜΙΛΙΑ ΠΡΟΣΚΕΚΛΗΜΕΝΗ ΟΜΙΛΙΑ

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ΘΕΜΑ: **Δομή και δυναμική νανοσύνθετων υλικών πολυμερούς / πολυστρωματικών πυριτιούχων πηλών.**

Structure and dynamics in polymer / layered silicate nanocomposites.

ΤΟΠΟΣ: Αίθουσα Σεμιναρίων ΙΤΕ/ΙΕΧΜΗ

ΗΜΕΡΟΜΗΝΙΑ: **Παρασκευή, 8 Ιουνίου 2012**

ΩΡΑ: **12:00**

ΠΕΡΙΛΗΨΗ:

Polymer materials are often filled with inorganic compounds in order to improve their properties. Over the last decade, attempts have been made to circumvent the compromises required in material design by utilizing nanoparticles as the inorganic additives, which, when dispersed within the polymeric matrix, produce a *nanocomposite*. Of particular interest among different organic/inorganic nanohybrids are polymer/layered silicate nanocomposites, which constitute a relatively new class of materials that has attracted growing scientific and technological interest due to their unique properties, which make them candidates for a number of potential applications. Mixing polymers with layered inorganic materials can lead to three different types of structure, depending on the specific interactions between the two components: the phase separated, the



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intercalated and the exfoliated one. Intercalated nanohybrids are model systems for the investigation of the static and dynamic properties of macromolecules in nano-confinement, using, however, macroscopic samples and conventional analytic techniques.

In this presentation, first we will briefly review our attempts to control the structure in polymer/layered silicate nanocomposites by understanding and/or altering the interactions between the chains and the surfaces. Then, we will describe in more detail our more recent efforts to elucidate the influence of the severe confinement on the structure and conformations of polymer chains in PEO / Na⁺-MMT hydrophilic nanohybrids utilizing XRD, DSC, FTIR and Raman spectroscopies and quasi-elastic neutron scattering (QENS). Intercalated hybrids with mono- and bi-layers of PEO chains are obtained for all compositions covering the complete range from pure polymer to pure clay. For low polymer concentrations, where all the polymer chains are intercalated, PEO is purely amorphous. As PEO concentration increases further, the polymer chains adsorbed on the outer surface of the clay particles remain amorphous as well. It is only when there is large amount of excess polymer outside the completely filled galleries that the bulk polymer crystallinity is abruptly recovered. The conformation of the confined or adsorbed polymer chains is found more disordered than the PEO melt even at higher temperatures; this is evident by the dramatic increase of the *gauche* conformations of the C-C bond along the chain backbone.

ΣΥΝΟΠΤΙΚΟ ΒΙΟΓΡΑΦΙΚΟ

Prof. Spiros H. Anastasiadis (<http://www.iesl.forth.gr/people/person.aspx?id=102>) is a Professor of Polymer Science and Engineering at the Department of Chemistry of the University of Crete and an affiliated researcher at the Foundation for Research and Technology - Hellas. He received his PhD in Chemical Engineering from Princeton University in 1988 working on Interfacial Tension of Immiscible Polymer Blends. He has been a Visiting Scientist at the IBM Almaden Research Center in 1988-1989. He was awarded the John H. Dillon Medal of the American Physical Society in 1998 and was elected Fellow of the American Physical Society in 2000. He has received the Materials Research Society Graduate Student Award in 1987 and the Society of Plastics Engineers - Plastics Analysis Division Best Paper Award during ANTEC 1985. He has been an Editor of the Journal of Polymer Science: Part B: Polymer Physics 5/2006-7/2010.



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S. H. Anastasiadis was the Founder, Organizer and Alternate Scientific Coordinator of the Department of Materials Science and Technology of the University of Crete (1999-2004) whereas he has been a Professor of Materials at the Department of Physics of the University of Crete (until 2005) and a Professor of Materials Science and Engineering at the Aristotle University of Thessaloniki (2005–2008). He has been the Alternate Chairman of the Department of Chemical Engineering (09/2007–10/2008), a Member of the Scientific Council of the Institute of Electronic Structure and Laser of the Foundation for Research and Technology – Hellas (01/2009–now), a Member of the Quality Assurance Committee (01/2009–now) and a Vice Chair of the Technical Council of the University of Crete (02/2011–now).

His research interests are in the areas of polymer surfaces/interfaces and thin films, block copolymers, polymer blends and homopolymer/copolymer blends, dynamics and diffusion in multi-constituents, organic/inorganic nanohybrid materials and responsive polymer systems. He has published 103 papers in refereed journals, 3 in books, 5 in refereed conference proceedings, and 77 in non-refereed conference proceedings. His work has been presented 336 times (57 invited plus 17 co-workers invited) in international meetings. He has given 54 invited lectures at academic and industrial institutions. As of May 10, 2012, he has received (ISI) 3728 total citations. His h-index is 33 (ResearcherID: D-2778-2009, <http://www.researcherid.com/rid/D-2778-2009>). He has edited 1 book and has translated (with co-workers) 1 textbook in Greek. He has edited 1 special issue of a scientific journal