

**ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ**  
**ΤΜΗΜΑ ΕΠΙΣΤΗΜΗΣ ΚΑΙ ΤΕΧΝΟΛΟΓΙΑΣ ΥΛΙΚΩΝ**

**ΠΡΟΣ**

- 1) Όλα τα μέλη ΔΕΠ του Τμήματος Επιστήμης και Τεχνολογίας Υλικών
- 2) Τους εκπροσώπους των Μεταπτυχιακών φοιτητών του Τ.Ε.ΤΥ
- 3) Την Επταμελή Εξεταστική Επιτροπή
- 4) Όλα τα μέλη της Πανεπιστημιακής Κοινότητας

**Πρόσκληση σε Δημόσια Παρουσίαση της Διδακτορικής Διατριβής της**  
**κ. Αχιλλέως Δήμητρας**

(Σύμφωνα με το άρθρο 12 του Ν. 2083/92)

Τη Δευτέρα, 21 Νοεμβρίου 2011 και ώρα 12:00μ στην αίθουσα  
Σεμιναρίων 3<sup>ου</sup> ορόφου-Φυσικό

θα γίνει η δημόσια παρουσίαση και υποστήριξη της Διδακτορικής Διατριβής της υποψήφιας διδάκτορος του Τμήματος Επιστήμης και Τεχνολογίας Υλικών κ. **Αχιλλέως Δήμητρας** με θέμα:

***“Synthesis of multiresponsive copolymers for the development of “smart” organic-inorganic hybrids”***

**ABSTRACT**

Spiropyran (SP)-based materials in the form of random copolymers, core-shell hybrid particles and hollow nanocapsules (NCPs) have been developed. The SP-based systems were synthesized by bulk and solution atom transfer radical polymerization (ATRP) from free or surface-bound initiators. The solvato-, pH-, temperature- and light-responsive behavior of the materials and their fluorescent properties were investigated.

Multiresponsive SP-based random copolymers were synthesized by the random copolymerization of 2-(dimethylamino)ethyl methacrylate (DMAEMA) with the in-house synthesized SP monomer 1',3',3'-trimethyl-6-methacryloyloxy-spiro(2H-1-benzopyran-2,2'-indoline). The copolymers

exhibited “reverse photochromism” and “negative solvatochromism” upon increasing the solvent polarity. Moreover, the PDMAEMA-*co*-PSP copolymers exhibited a reversible pH-responsive character in aqueous media, while their temperature-responsive behavior was affected by their content in merocyanine (MC) moieties and the photoregulated recovery of the SP species. Finally, the MC species of the copolymers exhibited a first-order photoinduced bleaching process in aqueous and organic media. A random copolymer exhibiting “normal photochromism” was also prepared using the in-house synthesized monomer 1'-(2-methacryloxyethyl)-3',3'-dimethyl-6-nitrospiro-(2*H*-1-benzopyran-2,2'-indoline) (SPMA). Stimulation of the copolymer with UV light in water resulted in the generation of three bipolar moieties, one X and two MC isomers, from the same parent SP molecule, which followed a biexponential thermal bleaching process. An intra- and inter-chain fluorescence resonance energy transfer (FRET) between the X and MC moieties, that constitute FRET donor-acceptor pairs, was found, which was favored by the association of the copolymer in solution.

In the second part, spherical PDMAEMA-*co*-PSPMA brushes were synthesized from the surface of silica particles by ATRP. Stimulation of the hybrids with UV light resulted in the isomerization of the SP units to two different bipolar species, X and MC, in water which provide a unique intraparticle FRET process to the system. This property is favored by the close proximity of the isomers promoted by the copolymer brush topology and can be successfully employed for the detection of biomolecules such as proteins and aminoacids.

Finally, an innovative approach for the light-driven supramolecular engineering of NCPs, based on reversible  $\pi$ - $\pi$  interactions in light-sensitive SP-containing spherical random copolymer brushes, is proposed. The pH-sensitive and inherent fluorescent behavior of the NCPs in water combined with their disruption by harmless visible light irradiation opens new avenues in the development of nanoscale NCPs for biomedical applications.

Ο πρόεδρος

Δ. Βλασσόπουλος