ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ

ΤΜΗΜΑ ΕΠΙΣΤΗΜΗΣ & ΤΕΧΝΟΛΟΓΙΑΣ ΥΛΙΚΩΝ

UNIVERSITY OF CRETE

DEPARTMENT OF MATERIALS SCIENCE & TECHNOLOGY

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 του

κ. Φαληρέα Παναγιώτη

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

Τη Δευτέρα 05 Οκτωβρίου 2015 και ώρα 12:00

στην αίθουσα Α210 στο κτίριο του Τμήματος Μαθηματικών

θα γίνει η δημόσια παρουσίαση και υποστήριξη της Διδακτορικής Διατριβής του υποψήφιου διδάκτορα του Τμήματος Επιστήμης και Τεχνολογίας Υλικών

κ. Φαληρέα Παναγιώτη με θέμα:

«Synthesis and Solution Behavior of Triple Stimuli-Responsive Micellar and Hybrid Janus Nanoparticles»

ABSTRACT

The main goal of this research is the synthesis and study of the solution behavior of triple responsive hybrid Janus and micellar nanoparticles. Hybrid Janus nanoparticles represent a new class of hybrid materials with an inorganic core and asymmetric grafting of polymer brushes from their surface. In this work, hybrid Janus nanoparticles bearing a hydrophobic polymer poly(methyl methacrylate) (PMMA); a hydrophobic polymer, poly(tert-butyl acrylate) (Pt-BA) that can be hydrolyzed to form an anionic and pH-responsive derivative poly(acrylic acid) (PAA); and a hydrophilic, cationic and pH- and temperature-responsive polymer, poly(2-(dimethylamino)ethyl methacrylate) (PDMAEMA) were synthesized. The successful grafting of the polymers from the surface of the silica nanoparticles was verified by TGA. Observation by FESEM provided insight on the topology of the hybrid Janus nanoparticles, suggesting the formation of acorn-like nanoparticles. The aqueous solution behavior of the Janus PDMAEMA and PAA nanoparticles were investigated by DLS, potentiometric titrations and zeta potential measurements verifying the responsive behavior of the nanoparticles. Additionally, well-defined hybrid Janus nanoparticles comprising an inorganic silica

Τ.Θ. 2208, 710 03 Ηράκλειο, Κρήτη
Τηλ.: 2810394270 & 72 Γραμματεία Φοιτητών
2810-394271 Γραμματεία Τμήματος
Fax: +30-2810-394273

P.O. Box 2208, GR-710 03, Heraklion, Crete, GREECE
Tel: +302810394270 & 72 Students' Secretariat
+30-2810-394271 Dept. Secretariat
e-mail: secretariat@materials.uoc.gr

core and a shell consisting of compartmentalized PAA and PDMAEMA chains were synthesized. The ampholytic hybrid Janus nanoparticles exhibited a pH-responsive behavior in aqueous solution due to the presence of both ionizable, DMAEMA and AA, groups on the nanoparticles' surface. DLS studies showed a variation of the hydrodynamic diameter of the polyamholytic hybrid nanoparticles as a function of solution pH.

In the second part of this work, hybrid Janus nanoparticles that respond to changes of the solution pH and temperature and to light irradiation were synthesized. For their synthesis, DMAEMA and the in-house synthesized monomer, 1',3',3'-trimethyl-6-methacryloyloxy-spiro(2H-1-benzopyran-2,2'-indoline) (SPMA) were copolymerized from the surface of Janus initiator nanoparticles by surface-initiated ATRP. The photo-thermo- and light-responsive behavior of the SiO_2-g-(PDMAEMA-co-PSPMA) hybrid Janus nanoparticles was investigated in water by UV/Vis and DLS studies, verifying the triple responsive behavior of the nanoparticles.

Finally, multiresponsive block copolymers were synthesized by the sequential ATRP of DMAEMA followed by the polymerization of SPMA. The PDMAEMA-*b*-PSPMA block copolymers can self-assemble into well-defined spherical micelles, comprising a hydrophobic PSPMA core and a hydrophilic PDMAEMA shell, in aqueous solution. The responsive behavior of the micelles when applying three different stimuli (i.e. light, pH and temperature) was verified, while their ability to encapsulate a model compound and release it in response to UV light irradiation was also investigated.