



ΠΡΟΣ

- 1) Όλα τα μέλη ΔΕΠ του Τμήματος Επιστήμης και Τεχνολογίας Υλικών**
- 2) Την Επταμελή Εξεταστική Επιτροπή**
- 3) Όλα τα μέλη της Πανεπιστημιακής Κοινότητας**

Πρόσκληση σε Δημόσια Παρουσίαση της Διδακτορικής Διατριβής του

κ. Ελευθέριου Κουφάκη

(Σύμφωνα με το άρθρο 41 του Ν. 4485/2017)

Την **Δευτέρα 16 Δεκεμβρίου 2019** και ώρα **10:00** στην **αίθουσα Τηλε-εκπαίδευσης**, στο κτήριο του **Τμήματος Μαθηματικών και Εφαρμοσμένων Μαθηματικών** του Πανεπιστημίου Κρήτης, θα γίνει η δημόσια παρουσίαση και υποστήριξη της Διδακτορικής Διατριβής του υποψήφιου διδάκτορα του Τμήματος Επιστήμης και Τεχνολογίας Υλικών **κ. Ελευθέριου Κουφάκη** με θέμα:

«Smart Polymer Coatings for Antimicrobial Surfaces»

“Smart” polymer coatings enable to tune the interfacial physico-chemical properties of a variety of organic and inorganic materials, at will. Polymer brushes, are ideal coatings for numerous applications, ranging from “smart”, controllable adhesive, biosensing and antimicrobial surfaces. This thesis presents the synthesis and characterization of novel, well-defined polymer brushes, bearing desirable functionalities, via surface-initiated atom transfer radical polymerization (SI-ATRP). The surface properties and the antimicrobial performance of the brushes were studied rendering them attractive for use as lubricants with responsive behavior and/or dual-functional antimicrobial surfaces in the solid state.

Homopolymer brushes based on 2-(dimethylamino)ethyl methacrylate, (DMAEMA), or fluorinated methacrylates, were synthesized, via SI-ATRP, on glass and silicon substrates. The PDMAEMA brushes were post-modified to introduce different alkyl chain lengths (ACLs) on the side groups of the end-grafted polymer chains. The hydrophilicity/hydrophobicity and the surface free energy of the brush were determined. A hydrophilic to hydrophobic transition of the surfaces and a significant decrease of the degree of quaternization of the DMAEMA moieties was found upon increasing the ACL of the quaternization agent. The adhesion and friction properties of the polymer brushes in the solid state against a sliding inorganic surface were also examined.

ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ

**ΤΜΗΜΑ ΕΠΙΣΤΗΜΗΣ &
ΤΕΧΝΟΛΟΓΙΑΣ ΥΛΙΚΩΝ**



UNIVERSITY OF CRETE

**DEPARTMENT OF MATERIALS
SCIENCE & TECHNOLOGY**

In the second part of the present study, amphiphilic diblock copolymer and binary mixed polymer brushes were prepared. The reorganization of the polymer chains and the switching of the film wettability, upon exposure to selective solvents for the two polymers, were observed. In addition, the mixed brushes exhibited tunable friction and surface energies, in response to external stimuli, which renders them attractive for use as “smart” surfaces in the dry state.

In the final part of the thesis, the quaternized PDMAEMA brushes were assessed as biocidal coatings exhibiting a bactericidal activity which was depended on the hydrophilicity/hydrophobicity of the surface. In another approach, the antifouling activity of the semi-fluorinated homopolymer brushes, was examined. Finally, dual functional coatings, comprising mixed polymer brushes of the bacterial-releasing fluorinated chains and the bactericidal quaternized PDMAEMA chains were shown to possess significantly improved antimicrobial performance, against both *E. coli* and *B. cereus*, due to their combined antifouling and bacteria killing action.