ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ **UNIVERSITY OF CRETE**

ΤΜΗΜΑ ΕΠΙΣΤΗΜΗΣ ΚΑΙ ΤΕΧΝΟΛΟΓΙΑΣ ΥΛΙΚΩΝ

DEPARTMENT OF MATERIALS SCIENCE AND 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 της

κα. Τερζάκη Κωνσταντίνας

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

Την Τρίτη 15 Οκτωβρίου 2013 και ώρα 10:00 στην αίθουσα Σεμιναρίων 1ου ορόφου-Φυσικό

θα γίνει η δημόσια παρουσίαση και υποστήριξη της Διδακτορικής Διατριβής της υποψηφίας διδάκτορος του Τμήματος Επιστήμης και Τεχνολογίας Υλικών κα. **Τερζάκη Κωνσταντίνας** με θέμα:

«Μη γραμμική μικρο-νανολιθογραφία με Λέιζερ Στενών Παλμών: Εφαρμογές στα Βιοϋλικά και Βιοαισθητήρες»
«Non-Linear Micro-Nanolithography With Short-Pulse Lasers: Applications on Biomaterials and Biosensors»

ABSTRACT

The present PhD thesis focuses on the development of biocompatible high-precision scaffolds with complex architectures for applications in the field of biomaterials and photonics. Self-assembled peptide fibrils were designed in order to be used as novel materials. Their positioning and integration into devices fabricated with femtosecond laser technologies, was further examined.

3D scaffolds with microscale features were fabricated with Direct femtosecond Laser Writing (DLW). The 3D structures were synthesized using a novel zirconium-containing organic-inorganic photosensitive material incorporating a metal-binding organic monomer in order to be further functionalized with metal-binding peptide fibrils. The scaffolds' resolution in structurability and metallization quality was investigated as well as their mechanical properties and their biocompatibility. Based on a previously studied octapeptide building block, bi-functional self-assembling oligopeptides were designed, having acidic amino acids in their sequence in order to

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nucleate calcium phosphate as well as metal ions. The self-assembled peptide fibrils were positioned on gold-ion functionalized 3D structures and subsequently acted as secondary scaffolds for the deposition of calcium phosphates aiming at hard tissue regeneration. Pre-osteoblastic cell adhesion, proliferation and a statistically significant increase of biomineralization makes the scaffold a promising method for bone tissue engineering.

The final part of the thesis refers to the precise positioning of self-assembled peptide fibrils, their controlled assembly and their integration into microsystems. Conductive 3D metallic micro/nanostructures were fabricated using a silver plating technique and subsequently metal-binding peptide fibrils were selectively positioned over the metalized structures forming oriented peptide bridges which were metalized in situ. The developed system can be proposed for conductivity measurements of self-assembled peptide fibrils aiming for their use in the field of biosensing.