ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ
ΤΜΗΜΑ ΕΠΙΣΤΗΜΗΣ ΚΑΙ ΤΕΧΝΟΛΟΓΙΑΣ ΥΛΙΚΩΝ

ΠΑΡΟΥΣΙΑΣΗ ΜΕΤΑΠΤΥΧΙΑΚΟΥ ΔΙΠΛΩΜΑΤΟΣ ΕΙΔΙΚΕΥΣΗΣ

Τίτλος

«Femtosecond laser induced biomimetic surfaces with unique wetting and optical properties»

«Δημιουργία βιομημιτικών επιφανειών με ξεχωριστές διαβροχικές και οπτικές ιδιότητες μέσω λέιζερ υπέρ-στενων παλμών»

Χριστίνα Λαναρά

Μεταπτυχιακή Φοιτήτρια

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Κτίριο Τμήματος Επιστήμης Υπολογιστών,

Πανεπιστήμιο Κρήτης

ABSTRACT

Nature has provided a plethora of functional surfaces exhibiting unique, complex hierarchical morphologies with dimensions of features ranging from the macroscale to the nanoscale. Biomimetics offer the possibility of biological systems simulation on artificial surfaces, with desired properties. In general, femtosecond laser induced surface structuring has been employed to produce numerous biomimetic structures for a range of applications, including microfluidics, tribology, tissue engineering and advanced optics. The present thesis comprises two parts. The first one is devoted to the fabrication of biomimetic micropatterned silicon substrates via ultra-short pulsed laser irradiation under SF_6 gaseous environment and their dry thermal oxidation in different time scales. This

technique leads to the fabrication of micropatterned silicon substrates with different silicon dioxide layer thicknesses. Based on these structures, hierarchical micro-nano-patterned silicon-Au substrates have been realised comprising gold nanoparticles, attached via silane chemistry, with various sizes and shapes. Both types of substrates have been characterized with respect to their morphological and optical properties. The second part is focused on the fabrication of biomimetic micro-nano-patterned steel substrates via ultra-short pulsed laser irradiation under NH_3 gaseous environment and their corrosion resistance in aqueous salt dilution. The substrates have been characterized with respect to their morphological and wetting properties. Our results show that the developed substrates exhibit unique improved wetting, anti-corrosive and optical properties.