Development of multi-functional surfaces with controllable wettability

Melani A. Frysali [*] [1,2], Georgia Kaklamani[1], Georgios Kenanakis[1], Lampros Papoutsakis[1,2], Spiros H. Anastasiadis[1,2]

[1] *Institute of Electronic Structure and Laser, Foundation for Research and Technology-Hellas, Heraklion Crete, Greece*

[2] *Department of Chemistry, University of Crete, Heraklion Crete, Greece*

The design of multifunctional surfaces based on biomimetic structures has gained the interest of the scientific community. This is mainly due to the potential applications including biomedicine, self-cleaning surfaces, microfluidics and catalysis. Such biomimetic structures can be achieved by using "smart" coatings, which can respond to external stimuli, such as light, temperature, electric field, pH or solvent selectivity. [1]

Novel multifunctional surfaces were developed, able to alter their wetting properties in response to both temperature and pH, by combining the chemical variation of the surface with the surface roughness. For this purpose, dual scale (micro/nano) rough surfaces were prepared by irradiating Si wafers using ultrafast (femtosecond) laser under a reactive atmosphere. Afterwards, organic coatings were introduced by anchoring end-functionalized polymer chains. These samples were seeded with human fibroblasts in order to examine the cellular response on both the surface roughness and the surface chemistry. [2]

Multi-responsive surface have also been developed, using chemically active inorganic layers (ZnO) together with responsive polymer films on rough surfaces. The formation of ZnO crystals on the rough surfaces was verified using X-ray diffraction (XRD), SEM and Atomic Force Microscopy (AFM). Contact angle measurements were conducted to investigate the wettability control of the polymeric surface. The photocatalytic features of the ZnO coated surfaces were investigated using UV-Vis spectroscopy and Fourier transform infrared spectroscopy (FT-IR) [3]

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* melina@iesl.forth.gr