

Patterned Biofunctional TiO₂ Surfaces Created by Ion-Beam Based Lithography

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Resume :

In this contribution we have used ion-beam based lithography to create patterned bio-functional surfaces on rutile TiO₂ single crystals. By MeV heavy ion irradiation and subsequent HF etching we create a well-defined array of square micrometer sized well-structures having modified and nano-structured TiO₂ surfaces, which shows different physical and chemical properties compared to the surrounding virgin TiO₂. The chemical differences are especially marked after the exposure to UV light and do not degrade after cycles of use or exposure to extreme environments. We present results on the characterization of the patterned substrates using e.g. XRD, SEM, AFM and He-ion microscopy. In addition, the functionality of the patterned substrates is illustrated when subjected to different bio-objects. Dip-pen lithography is applied for limited deposition of single stranded DNA (oligonucleotide) and lipids (synthetic phosphocholine). Preliminary results show the implications of different wettability behaviour of the micro-wells compared to virgin TiO₂, and the suitability of the dip-pen technique to deploy oligonucleotides and lipids inside the micro-wells. Possible mechanisms responsible for the observed bio-functionality of TiO₂, and their near future application for biosensing and cell culture will be discussed.

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