

Bone Cells Growth and Proliferation on TiO₂ Nanotubes Modified by Plasma Discharge

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Abstract:

Titanium implants are commonly used for a large number of medical applications that range from dental, hip, or knee replacements. One of the major problems is the bio-compatibility of these Titanium surfaces and the lack of cellular proliferation on its surface, which could reduce its integration in the osseous system. We report the fabrication of a self-assembled vertical and ordered nanotubular TiO₂ array by electrochemical anodization. The samples were analyzed by electron microscopy, Raman spectroscopy and atomic force microscopy. Bone Cells MC3T3-E1 were grown in TiO₂ Nanotube substrates and their proliferation was analyzed by optical microscopy. It was observed a good cellular proliferation on the TiO₂ nanostructures, but which was significantly influenced by the surface modification of the substrates. Oxygen and Nitrogen plasma treatments were found to significantly alter the proliferation of the bone cells over the TiO₂ substrates. These findings can be explained by the introduction of various O and N groups onto the TiO₂ surfaces during the plasma treatment.