Obtaining nanostructures in titanium oxide by photoelectrochemical etching technique

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Palavra chave: Nanostructure, titanium, photoetching

Resumo:
Surface modification in the nanometer scale play an important role in the adsorption of proteins, adhesion of osteoblastic cells and thus the rate of osseointegration. Several techniques has been studied to produce an ideal surface, with chemical composition, crystalline structure, roughness and morphology that induces bone formation. The SLA (sandblasted and acid-etched) technique is well known, producing a surface with controlled roughness at the micro-scale. On the other hand, photoelectrochemical etching is a known technique to corrode in a controlled way the titanium oxide layer, usually producing nanopores. The aim of this work was to combine both techniques to produce a rough surface with nanofeatures produced by photoetching. Cp-Ti grade 4 samples were grinded, polished and ultrasonically cleaned. The SLA was carried out through Al2O3 blasting followed by acid etching at 65 °C for 1 hour using an aqueous solution of H2SO4 and HCl. After the etching, the samples were heat-treated at 500 °C during 5 h in order to obtain a rutile oxide layer. The crystalline layer was submitted to photoetching in a 0.1 M H2SO4 solution using a high-pressure Hg arc lamp of 250 W. XRD analysis showed that the sample after treatment present both rutile and anatase phases. The SEM images show the formation of nanopores over the rough surface. This increase in roughness implies a greater wettability of the implant, which plays a major role in adsorption of proteins and cell adhesion.