



The study of surface characterization of ultrafine grained titanium and osteoblast adhesion under different types of roughened treatment



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Objective: To investigate the surface characterization of ultrafine grained titanium (UFG Ti) and osteoblast adhesion under different roughened sandblasting and acid-etching (SLA) treatments.

Methods: The billets of UFG Ti and commercially pure titanium Ti (CP Ti) were incised into cylindrical specimens with 7mm in diameter and 2mm in height. The specimens were sand blasted at different air pressure and then acid-etched. The surface morphology, roughness and surface wettability of the specimens were analyzed after they were modified by SLA. The cell morphology and cell density were observed after MC3T3-E1 cells were seeded onto the specimens and cultured for 1d, 3d and 5d. The control group was CP Ti.

Results: The different hierarchical porous topographies were formed on the surface of UFG Ti and CP Ti after modified by SLA. The sizes of blasted holes on the surface of both materials and roughness of them increased with increasing of blasted pressure, but the values of UFG Ti were lower than that CP Ti correspondingly. The surface wettability of them was also change with the blasted pressure, but the value of UFG Ti was significantly smaller than CP Ti. When the blasted pressure was 0.6Mpa, the UFG Ti exhibited excellent wettability. The morphology of cells on UFG Ti was superior to CP Ti, and the cell density was the highest at blasted pressure of 0.6Mpa.

Conclusion: The UFG Ti exhibits proper surface morphology, roughness and excellent wettability, which is more appropriate for adhesion and proliferation of MC3T3-E1 cells when it was modified by SLA at blasted pressure of 0.6Mpa.

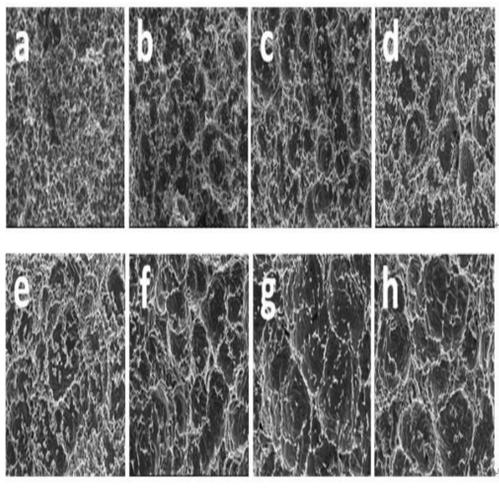


Fig. 1 The surface micromorphology of UFG Ti and CP Ti

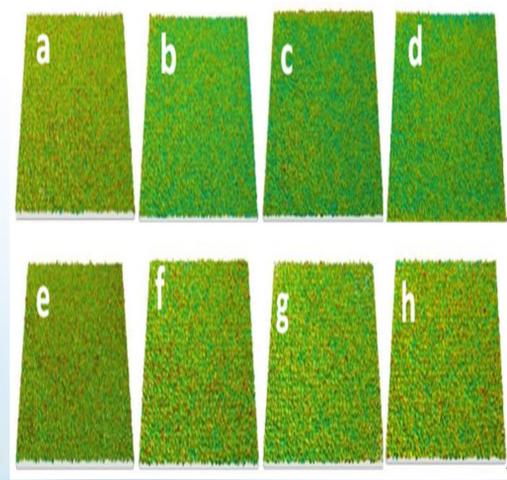


Fig. 2 The 3D topography of UFG Ti and CP Ti

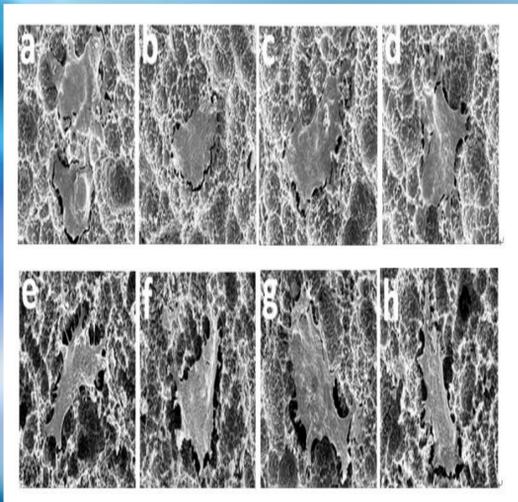


Fig. 3 The adhesion morphology of cells on the surface of UFG Ti and CP Ti

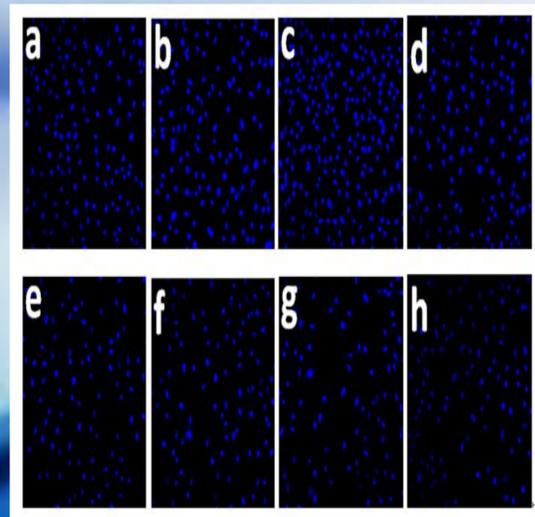


Fig. 4 DAPI staining of cells on UFG Ti and CP Ti