Short Communication

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Microwave treatment of calcium phosphate titanium dioxide composite to improve protein adsorption

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Abstract

Calcium phosphate has received a great deal of attention as a bone regeneration material in the biomedical field. In this study, we investigated the effect of microwave treatment on TiO2 Nano flowers with calcium phosphate deposits to improve protein adsorption. Hierarchical rutile-type TiO2 Nano flowers prepared by the hydrothermal method were immersed in a modified simulated body fluid for 3 days to induce the formation of calcium phosphate, and then irradiated with microwaves Coating a dental implant with CAP / TiNF gives you control over the structure, morphology and thickness of the composite, providing a means to improve its biological properties. The composite materials were characterized by scanning electron microscopy X-ray diffraction field emission transmission electron microscopy and Fourier transform infrared spectroscopy respectively Foreword. Calcium phosphate (CAP) has long been used in medicine and dentistry due to its excellent biocompatibility, bioactivity and osteoconductivity.[1] CAP ceramics are very similar in composition to biological tissue and are therefore more biocompatible than other materials used to replace hard tissue. However, such materials have not been extensively studied in terms of protein adsorption and their effects on cell adhesion are unclear of the various surface properties, surface roughness and composition are generally considered to be the most important parameters that alter cell activity. Surface treatment of ceramic materials is required to produce microstructures with the required properties. Sintering affects the properties of materials such as chemical composition and ultrastructure, and affects the biological and mechanical performance of CAP ceramics.

Microwave processing

Currently, microwaves are used for material processing. However, little is known about the actual mechanism of heating by microwave irradiation. Many common warming's, such as B. bipolar heating and conduction heating, have been primarily considered[2-3]. A heating mechanism involved in the interaction of microwaves with different materials in different ways. Microwaves are electromagnetic waves composed of electric and magnetic fields. Both fields are orthogonal to each other at wavelengths in the range 1-1000 mm. Microwaves are converted into thermal energy depending on the type of interaction with the target material[4].

Material and Methods

Preparation of TiO2 Nanomaterials

TiNF deposition on a polished pure titanium substrate (cp-Ti, grade 2, diameter 12 mm) was achieved by a hydrothermal process as described above. Briefly, with 0.75 mL of titanium (IV) isopropoxide (TTIP, 97%, Sigma-Aldrich, St. Louis, MO), 15 mL of hydrochloric acid (HCl, 37%, Merck, St. Louis, Missouri, USA). 15 mL of redistricted water was mixed at room temperature in an autoclave jar lined with 50 mL of Teflon. The autoclave temperature was set to 180 ° C, and a heating rate of 5°C min-1 and natural oven cooling achieved growth of the Nano flower structure for 3 hours[5].

Preparation of calcium phosphate coating and microwave treatment

Preparation of simulated body fluid and immersion of TiNF samples in SBF solution is Kokubo et al. It was performed according to the method described by m-SBF solution with twice as much as SBF solution to get more calcium phosphate. TiNF samples were immersed in 50 mL of modified SBF at 37 ° C for 3 days. The m-SBF solution was replaced after 2 days to maintain the concentration of calcium phosphate coated on TiNF.

Conclusion

The purpose of this study was to investigate the effect of MW treatment of CAP / Ti NF on protein adsorption. Hierarchical rutile Ti NF produced by the hydrothermal method was immersed in m-SBF for 3 days to promote the formation of CAP and then irradiated with MW wire. Ti NF formed a rod-like morphology due to the stacking of self-assembled spherical nanoparticles in a particular direction. These microcrystals aggregated in Nano-sized particles with a spherical shape and low HA crystallinity of calcium phosphate and were exposed to MW for 0-10 minutes[6-7]. A slight increase in contact angle was observed with increasing MW exposure time.

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