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BIOMIMETIC HYDROXYAPATITE COATING ON C.P. Ti AND Ti-6Al-4V ALLOY BY ACID AND ALKALI TREATMENT

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Abstract

Titanium metal and its alloys have been widely used as implants under load-bearing conditions due to their biocompatibility, excellent corrosion resistance and lightness, but their inability to bond to living bone is a setback. The experiments outlined here investigated hydroxyapatite (HA) coating on Ti metal implants, used to enhance their bioactive properties. In this study, specimens of commercially pure titanium (c.p. Ti) and Ti-6Al-4V were etched in either H_3PO_4 or HCl, and subsequently treated in 15 M NaOH. The surfaces of acid-etched c.p. Ti showed a porous structure while those of acid-etched Ti-6Al-4V showed some grinding marks, but no porosity. After subsequent alkali treatment in NaOH, the surfaces of both c.p. Ti and Ti-6Al-4V substrates exhibited microporous network structures composed of $Na_2Ti_5O_{11}$. The pre-treated specimens were then immersed in simulated body fluid (SBF) at 37 °C up to 14 days. HA began to deposit on acid-etched and NaOH-treated Ti-6Al-4V within a day of immersion in SBF. After 14 days of immersion in SBF, a dense and uniform layer was produced on the surfaces of acid-etched and NaOH-treated Ti-6Al-4V. The HA formation rate was the highest for HCl and NaOH pre-treated samples. Thus, this method of HA coating on c.p. Ti and Ti-6Al-4V shows promise in its application for artificial bone substitutes or other hard tissue replacement materials with heavy load-bearing requirements. Aside from their desirable combination of bioactivity, they also exhibit excellent corrosion resistance and their processing costs are low.

Key words: biomimetic, coating, simulated body fluid, Titanium alloy

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