UNIVERSITI TEKNOLOGI MARA

BIOMIMETIC COATING OF CALCIUM PHOSPHATE APATITE ON THE ALKALI-THERMAL PRE-TREATED TI6AL4V

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CONFIRMATION BY PANEL OF EXAMINERS

I certify that a Panel of Examiners has met on 10th August 2017 to conduct the final examination of Nurul Hazwani Binti Hanib in her Master of Science thesis entitled "Biomimetic Coating of Calcium Phosphate Apatite on The Alkali-Thermal Pre-Treated Ti6Al4V" in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiner recommends that the student be awarded the relevant degree. The Panel of Examiners was as follows:

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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ABSTRACT

A biomimetic technique has been explored in the production of a high biocompatibility titanium (Ti) apatite-coated. To form this coated material, a pre-treatment on the Ti surface are required to achieve an active surface either chemically or thermally treated. Usually, Simulated Body Fluid (SBF) solution is used in biomimetic apatite coating. In some cases, the apatite-forming on the metallic surface may take up to 4 weeks in SBF solution. By increase the concentration of SBF seems to work in shortening the period of apatite-forming yet the high concentration of the instable SBF solution is not easy to handle. Another potential solution that mimics to human blood plasma was figured out in this study to fasten the apatite-forming. The aim of this research was to investigate the formation of apatite in Dulbecco's Phosphate Buffered Saline with $CaCl_2$ and $MgCl_2$ (DPBS-CaMg) solution on the surface of Ti6Al4V which was treated with alkali and thermal treatment. The bioactive surface on Ti6Al4V was prepared by alkali treatment using 5 mol/L sodium hydroxide (NaOH) and 5 mol/L potassium hydroxide (KOH) and consolidated by heat treatment at 500, 600, 700 and 800°C. The morphology structure, phase changes, wettability and chemical composition of treated surface and apatite coating were characterised. The results demonstrated that DPBS-CaMg has a great influenced on apatite formation within 3 days. Furthermore, the Ti6Al4V surface characteristic produced through alkali-thermal treatment were also contribute to the homogenous bone-like apatite with hydrophilic surface at Ca/P ratio between 1.3 and 2.0 (amorphous calcium phosphate). Thus, the DPBS-CaMg solution can be used as a substitute biomimetic solution for apatite coating at a low processing temperature for bioactive coating of the medical implant within a short time period.

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