FINAL PROJECT

IMPROVING SURFACE PROPERTIES OF BILAYER HYDROXYAPATITE(HA) COATING ON TI-6AL-4V ELI AND TNTZ USING DIP-COATING METHOD FOR INCREASING OSSEOINTEGRATION

Submitted to Fulfill Requirement on Bachelor Degree (S1)

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ABSTRACT

Bone implants preparation, with hydroxyapatite (HA) coating, is a hot topic of discussion according to recent study in orthopedics due to the need for bone implant materials that have high biocompatibility properties. This experiment aims to form the surface of the implant material which is completely covered with hydroxyapatite (HA) so that the implant is more biocompatible and increasing osseointegration with body tissues. In this research, a bilayer coating will be made on the surface of Ti-6Al-4V ELI and TNTZ using the dip-coating method with the first layer being a nano-scale of hydroxyapatite (HA) and the second layer being a micron-scale of hydroxyapatite (HA). The sol-gel, which is used to help the hydroxyapatite adhere to the metal surface of the implant, is prepared by mixing KH_2PO_4 liquid and $Ca(NO_3)_2$ liquid, and NH_4OH as a catalyst. The coating process is regulated through the dip-coating apparatus with dipping and withdrawing process, for the first layer uses a rate of 4 mm/s respectively and uses a rate of 8 mm/s respectively for the second layer. The material is dried and sintered at 800^0C in oven for the first and second layer respectively. After obtaining the hydroxyapatite bilayer on the metal surface, the coating surface quality inspection will be carried out by checking microstructure of hydroxyapatite bilayer using SEM, the roughness using surface roughness tester, the thickness of HA coating bilayer using thickness gauge tool, and adhesion strength of the coating layer using microstructure analysis approach. In this experiment, obtained that the average roughness of TNTZ is 4,030 µm which has few cracks compared to Ti-6Al-4V ELI which has macro cracks with a roughness of 3,191µm. The average thickness of the bilayer layer on Ti-6Al-4V ELI was 217.25 µm while for TNTZ it was 222.25 µm. The adhesive bonding observed from the research samples is low adhesive bonding characterized by the presence of porosity or gaps between the layers and the metal under the image of a scanning electron microscope (SEM).

Keywords: Ti-6Al-4V ELI, TNTZ, Hydroxyapatite, dip-coating, bilayer coating, sintering, surface roughness, adhesive bonding.