KONTRIBUSI PENAMBAHAN PVA UNTUK PENINGKATAN ADHESI LAPISAN HIDROKSIAPATIT PADA MATERIAL IMPLAN Ti-6Al-4V ELI UNTUK APLIKASI BIOMEDIS

LAPORAN PENELITIAN

SANNY ARDHY
2241612046

PEMBIMBING :

Ir. Insannul Kamil, M.Eng, Ph.D, IPU, ASEAN Eng

PROGRAM STUDI PENDIDIKAN PROFESI INSINYUR
SEKOLAH PASCASARJANA
UNIVERSITAS ANDALAS

2024

ABSTRACT

Ti-6Al-4V Extra Low Interstitial (ELI) is the most widely used titanium alloy for orthodontic and orthopedic implants. This titanium alloy possesses better mechanical properties compared to pure titanium (CpTi) and Ti-6Al-4V. It also has a low elastic modulus, which closely approximates the elastic modulus of human bone. However, its drawback lies in its low bioactivity. Therefore, Ti-6Al-4V ELI needs to be coated with hydroxyapatite to achieve good osseointegration with bone within the human body. Nevertheless, research findings indicate that cracks are frequently observed on the surface of the hydroxyapatite coating. These cracks may potentially lead to implant failure in the future. This research aims to reduce cracking in the coating layer of Ti-6Al-4V ELI implant materials. The method involves adding Polyvinyl Alcohol (PVA) to reinforce the hydroxyapatite coating. The study employs the Dip Coating method for coating Ti-6Al-4V ELI implant material samples. The PVA used is commercial nano-sized PVA. The hydroxyapatite layer is mixed with PVA (16.67% and 20% by weight) for reinforcement. After coating the specimens, a sintering process is conducted at temperatures of 800°C, 900°C, and 950°C with a heating rate of 5°C/min. The study results show that the addition of PVA can reduce cracks in the coating layer of Ti-6Al-4V ELI implant materials. The optimal results are achieved with 20% PVA by weight and a sintering temperature of 900°C. The implant material surface is uniformly coated, with no cracks observed. In contrast, under the same parameters, the hydroxyapatite coating without PVA addition shows slight cracking.

Keywords: Adhesion, hydroxyapatite, PVA, cracking, Ti-6Al-4V ELI