

## **FINAL PROJECT**

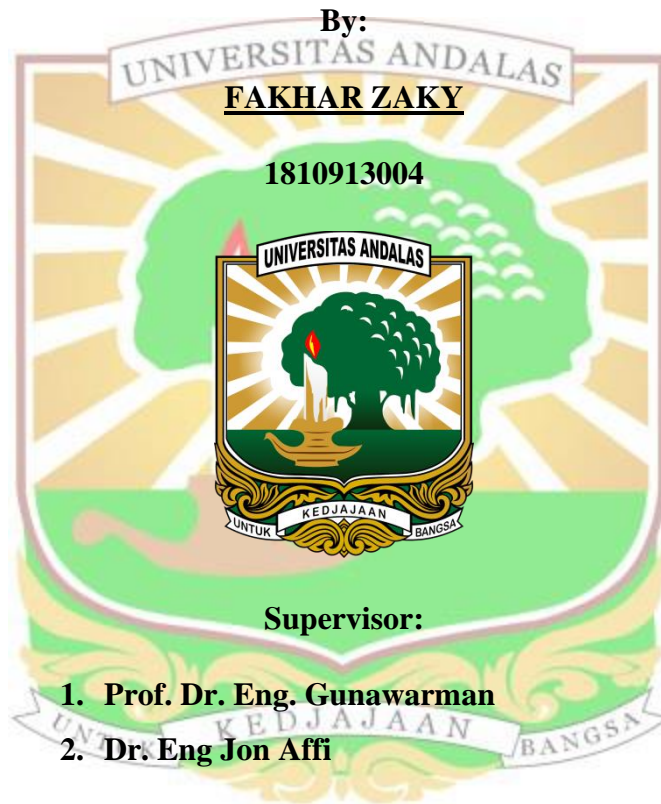
# **EFFECT OF SINTERING TEMPERATURE ON ADHESION STRENGTH OF HYDROXYAPATITE COATING LAYER OF TITANIUM TNTZ PREPARED BY DIP COATING METHOD**

*Submitted to Fulfill Requirement on Bachelor Degree (S1)*

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## ABSTRACT

The implant material suitable for implantation is Ti29Nb-13Ta-4,6Zr (TNTZ) due to high biocompatibility, more corrosion resistance, and low modulus of elasticity compared to other titanium alloys. However, this material is still not bioactive when applied to implantation. To trigger bone osseointegration in implantation, it is still required to coat the material with hydroxyapatite which has bioactive properties. Dip coating is the chosen coating technique because it provides good covered surface while being cost- and procedure-effective. Before being coated, TNTZ is prepared with a diameter of 1.5 mm and a thickness of 4 mm. The sol-gel, which is used to help the hydroxyapatite adhere to the metal surface of the implant, is prepared by mixing  $\text{KH}_2\text{PO}_4$  liquid,  $\text{Ca}(\text{NO}_3)_2$  liquid, and  $\text{NH}_4\text{OH}$  as a catalyst. The coating process uses the dip coating method with an immersion time of 30 seconds and a withdrawal speed of 4 mm/s. Then a sintering process is carried out to increase the adhesion strength of the coating. Low adhesion between the coating layer and substrate may result in the detachment of the coating layer during implantation. This causes the release of the oxide layer ( $\text{TiO}_2$ ) produced by the titanium into the body's tissues and triggers an inflammatory response. To prevent inflammation, it is necessary to have the right sintering temperature to prevent detachment of the coating layer. In this study, the TNTZ material is sintered with temperature variations of 700 °C, 800 °C, and 900 °C for 1 hour. Observations were made to see the effect of sintering temperature on the adhesion strength of the hydroxyapatite layer. Observation of the surface morphology of the coating layers was carried out using an *Olympus SZX10 LG-PS2 stereo microscope* and SEM. Then testing the coating thickness using a thickness gauge tool and testing the adhesion strength using the pull-off test method. In the experiment, the highest adhesion strength value is obtained when the sample is sintered at 700 °C because the surface morphology is not cracked, the covered surface value is high, that is 91.6 %, the thickness value is the lowest compared to other samples, that is 198.47  $\mu\text{m}$ .

**Keywords:** Ti-29Nb-13Ta-4,6Zr (TNTZ), hydroxyapatite (HA), dip coating, sintering temperature, adhesive bonding