

INTISARI

Pengaruh Durasi Pelapisan Titanium Dengan Hidroksiapatit Berbahan Dasar Tulang Ikan Patin Menggunakan Metode *Plasma Electrolytic Oxidation*

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Penelitian ini bertujuan untuk mengkaji pelapisan titanium (Ti-6Al-4V) dengan hidroksiapatit (HA) berbasis tulang ikan patin menggunakan metode *Plasma Electrolytic Oxidation* (PEO). Proses dilakukan dengan variasi waktu pelapisan 10, 20, dan 30 menit, menghasilkan empat sampel: Raw-Ti, Ti/HA-10, Ti/HA-20, dan Ti/HA-30. Larutan elektrolit terdiri atas 0,029M NaH₂PO₄.H₂O dan 0,05M NaOH (pH 12) dengan penambahan 1,5 g/L HA. Proses PEO dijalankan pada tegangan 400 V dengan pengadukan 80 rpm. Karakterisasi dilakukan untuk mengevaluasi mekanisme pembentukan dan kualitas lapisan HA. Fase kristal diidentifikasi dengan XRD, gugus fungsi HA dikonfirmasi melalui FTIR, morfologi dan tampang lintang dianalisis menggunakan SEM, serta sifat mekanik diuji dengan uji kuat tekan.

Hasil menunjukkan bahwa metode PEO berhasil mendeposisikan HA pada permukaan titanium. Intensitas puncak difraksi HA tertinggi dan spektrum fosfat paling tajam terdeteksi pada sampel Ti/HA-10. Sampel Ti/HA-10 dan Ti/HA-20 memiliki struktur permukaan berpori homogen, porositas >60%, dan ketebalan lapisan oksida yang tinggi, menandakan deposisi HA yang optimal. Ketiga sampel menunjukkan kuat tekan <200 MPa dan modulus Young <10 GPa, mendekati nilai kuat tekan tulang kortikal manusia. Berdasarkan keseluruhan hasil, waktu pelapisan optimum berada pada rentang 10–20 menit.

Kata kunci: hidroksiapatit, *Plasma Electrolytic Oxidation* (PEO), *titanium coating*, tulang ikan patin

ABSTRACT

The Effect of Titanium Coating Duration with Hydroxyapatite Based on Iridescent Catfish Bone Using Plasma Electrolytic Oxidation Method

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This study aims to investigate the coating of titanium (Ti-6Al-4V) with hydroxyapatite (HA) derived from catfish bone using the Plasma Electrolytic Oxidation (PEO) method. The coating process was conducted at 10, 20, and 30 minutes, producing four samples: Raw-Ti, Ti/HA-10, Ti/HA-20, and Ti/HA-30. The electrolyte solution consisted of 0.029 M $\text{NaH}_2\text{PO}_4 \cdot \text{H}_2\text{O}$ and 0.05 M NaOH (pH 12), with the addition of 1.5 g/L HA. PEO was carried out at a voltage of 400 V with stirring at 80 rpm. Characterization was conducted to evaluate the deposition mechanism and coating quality. The crystalline phases were identified using XRD, functional groups were confirmed via FTIR, surface and cross-sectional morphology were analyzed by SEM, and mechanical properties were assessed through compressive strength testing.

The results demonstrated that the PEO method successfully deposited HA on the titanium surface. The Ti/HA-10 sample exhibited the highest HA diffraction peak and the sharpest phosphate absorption bands. Ti/HA-10 and Ti/HA-20 showed homogeneous porous surface structures, porosity above 60%, and high oxide layer thickness, indicating optimal HA deposition. All coated samples exhibited compressive strengths below 200 MPa and Young's modulus below 10 GPa, approaching the strength of human cortical bone. Overall, the optimal coating duration was found to be in the range of 10–20 minutes.

Keywords: catfish bone, hydroxyapatite, Plasma Electrolytic Oxidation (PEO), titanium coating