



DAFTAR PUSTAKA

- Abbasi, S., Bayati, M. R., Golestani-Fard, F., Rezaei, H. R., Zargar, H. R., Samanipour, F., & Shoaei-Rad, V. (2011). Micro arc oxidized HA_p-TiO₂ nanostructured hybrid layers-part I: Effect of voltage and growth time. *Applied Surface Science*, 257(14), 5944–5949. <https://doi.org/https://doi.org/10.1016/j.apsusc.2011.01.057>
- Adeleke, S. A., Ramesh, S., Bushroa, A. R., Ching, Y. C., Sopyan, I., Maleque, M. A., Krishnasamy, S., Chandran, H., Misran, H., & Sutharsini, U. (2018). The properties of hydroxyapatite ceramic coatings produced by plasma electrolytic oxidation. *Ceramics International*, 44(2), 1802–1811. <https://doi.org/10.1016/j.ceramint.2017.10.114>
- Ajiriyanto, M. K., & Anawati, A. (2022). Kajian Literatur Karakteristik Lapisan Keramik Oksida yang Ditumbuhkan Diatas Paduan Zirkonium dengan Metode Plasma Electrolytic Oxidation. *Indonesian Journal Of Applied Physics*, 12(1), 19. <https://doi.org/10.13057/ijap.v12i1.49853>
- Aliofkhazraei, M., Macdonald, D. D., Matykina, E., Parfenov, E. V., Egorkin, V. S., Curran, J. A., Troughton, S. C., Sinebryukhov, S. L., Gnedenkov, S. V., Lampke, T., Simchen, F., & Nabavi, H. F. (2021). Review of plasma electrolytic oxidation of titanium substrates: Mechanism, properties, applications and limitations. *Applied Surface Science Advances*, 5. <https://doi.org/10.1016/j.apsadv.2021.100121>
- Anawati, A., Asoh, H., & Ono, S. (2017). Effects of alloying element ca on the corrosion behavior and bioactivity of anodic films formed on AM60 mg alloys. *Materials*, 10(1). <https://doi.org/10.3390/ma10010011>
- Ardhiantika, P., Basuki, A., & Sunarmasto. (2021). Kajian Kuat Tekan, Kuat Tarik, Kuat Lentur Dan Redaman Bunyi Pada Panel Dinding Beton Ringan Dengan Agregat Limbah Plastik Pet. *Jurnal Matriks Teknik Sipil*.
- Ariandari, F. A. (2021). Pengaruh Ketebalan Lapisan Hidroksiapatit Terhadap Pengaruh Ketebalan Lapisan Hidroksiapatit Terhadap Karakteristik Permukaan Material Titanium Paduan Ti-29Nb-13Ta-4,6Zr (TNTZ) Pasca Implantasi.
- Aubakirova, V., Farrakhov, R., Sharipov, A., Polyakova, V., Parfenova, L., & Parfenov, E. (2022). Investigation of biocompatible pEO coating growth on cp-Ti with in situ spectroscopic methods. *Materials*, 15(1). <https://doi.org/10.3390/ma15010009>
- Aziz, I., Mahmudah, H., & Yusuf, Y. (2022). Pembentukan Permukaan Porous Lapisan Tipis Ti-Cu-N Pada Permukaan Stainless Steel 316l Menggunakan Metode Anodisasi. 12(1), 202–208.
- Bulan, J. C., Hendrawan, I. G., & Ria Puspitha, N. L. P. (2020). Analisis Kelimpahan dan Identifikasi Predator Abalon (*Haliotis squamata*) di Pantai Geger, Nusa Dua, Bali. *Journal of Marine Research and Technology*, 3(1), 1. <https://doi.org/10.24843/jmrt.2020.v03.i01.p01>



- Bumgardner, J. D., Vasquez-Lee, M., Fulzele, K. S., Smith, D. H., Branch, K. D., Christian, S. I., & Williams, D. L. (2008). *Biocompatibility Testing in Encyclopedia of Biomaterials and Biomedical Engineering*.
- Bunaciu, A. A., Udriștioiu, E. gabriela, & Aboul-Enein, H. Y. (2015). X-Ray Diffraction: Instrumentation and Applications. *Critical Reviews in Analytical Chemistry*, 45(4), 289–299. <https://doi.org/10.1080/10408347.2014.949616>
- Calabria, U., Calabria, U., Mastropietro, F., Scarpelli, F., Godbert, N., & Godbert, N. (2018). *Mesoporous TiO Mesoporous TiO₂ Thin Thin Films : Films : State State of of the the Art. June 2018*. <https://doi.org/10.5772/intechopen.74244>
- Dorozhkin, S. V. (2009). Calcium orthophosphates in nature, biology and medicine. In *Materials* (Vol. 2, Nomor 2, hal. 399–498). MDPI AG. <https://doi.org/10.3390/ma2020399>
- Dorozhkin, S. V. (2010). Bioceramics of calcium orthophosphates. In *Biomaterials* (Vol. 31, Nomor 7, hal. 1465–1485). <https://doi.org/10.1016/j.biomaterials.2009.11.050>
- Dorozhkin, S. V. (2011). Calcium orthophosphates: occurrence, properties, biomineralization, pathological calcification and biomimetic applications. In *Biomatter* (Vol. 1, Nomor 2, hal. 121–164). <https://doi.org/10.4161/biom.18790>
- Durdur, S., Deniz, Ö. F., Kutbay, I., & Usta, M. (2013). Characterization and formation of hydroxyapatite on Ti6Al4V coated by plasma electrolytic oxidation. *Journal of Alloys and Compounds*, 551, 422–429. <https://doi.org/10.1016/j.jallcom.2012.11.024>
- Dzhurinskiy, D., Gao, Y., Yeung, W. K., Strumban, E., Leshchinsky, V., Chu, P. J., Matthews, A., Yerokhin, A., & Maev, R. G. (2015). Characterization and corrosion evaluation of TiO₂:n-HA coatings on titanium alloy formed by plasma electrolytic oxidation. *Surface and Coatings Technology*, 269(1), 258–265. <https://doi.org/10.1016/j.surfcoat.2015.01.022>
- Epp, J. (2016). 4 - X-ray diffraction (XRD) techniques for materials characterization. In G. Hübschen, I. Altpeter, R. Tschancky, & H.-G. Herrmann (Ed.), *Materials Characterization Using Nondestructive Evaluation (NDE) Methods* (hal. 81–124). Woodhead Publishing. <https://doi.org/https://doi.org/10.1016/B978-0-08-100040-3.00004-3>
- Fitriani, C. Y., & Wibawa, A. (2019). Biokompatibilitas Material Titanium Implan Gigi. *Insisiva Dental Journal : Majalah Kedokteran Gigi Insisiva*, 8(2). <https://doi.org/10.18196/di.8208>
- Fultz, B., & Howe, J. (2013). *Diffraction and the X-Ray Powder Diffractometer* (hal. 1–57). https://doi.org/10.1007/978-3-642-29761-8_1
- Gilbert, J. L. (2020). *Metals: Basic Principles in Biomaterials science : an introduction to materials in medicine*.
- Herath, I., Davies, J., Will, G., Tran, P. A., Velic, A., Sarvghad, M., Islam, M., Paritala, P. K., Jaggesar, A., Schuetz, M., Chatterjee, K., & Yarlagadda, P. K.



- D. V. (2022). Anodization of medical grade stainless steel for improved corrosion resistance and nanostructure formation targeting biomedical applications. *Electrochimica Acta*, 416, 140274. <https://doi.org/https://doi.org/10.1016/j.electacta.2022.140274>
- Hermawan, H. (2019). Pengenalan pada biomaterial. <https://doi.org/10.31227/osf.io/v3z5t>
- Hou, F., Gorthy, R., Mardon, I., Tang, D., & Goode, C. (2022). Low voltage environmentally friendly plasma electrolytic oxidation process for titanium alloys. *Scientific Reports*, 12(1). <https://doi.org/10.1038/s41598-022-09693-w>
- Hsieh, J. H., Li, C., Lin, Y. C., Chiu, C. H., Hu, C. C., & Chang, Y. H. (2015). Antibacteria and anti-wear TaN-(Ag,Cu) nanocomposite thin films deposited on polyether ether ketone. *Thin Solid Films*, 584, 277–282. <https://doi.org/https://doi.org/10.1016/j.tsf.2015.02.063>
- Hussein, R. O., Northwood, D. O., & Nie, X. (2010). Coating growth behavior during the plasma electrolytic oxidation process. *Journal of Vacuum Science & Technology A: Vacuum, Surfaces, and Films*, 28(4), 766–773. <https://doi.org/10.1116/1.3429583>
- Jameel, A. (2015). *Study Of Mechanical Properties Of Bones And Mechanics Of Bone Fracture Estimation of Crack Tip Plastic Zones View project Large Deformation in Bi-Material Components View project. December.* <https://www.researchgate.net/publication/307982612>
- Kang, B. M., Park, H.-K., Jang, J.-H., Jeong, W.-J., Lee, K.-K., Oh, I.-H., Cho, H.-S., Ahn, H.-G., & Lim, Y.-S. (2014). A Study on the Sintering Of HA_p Sputtering Target Material for Biomedical Applications. *International Journal of Innovative Research in Science, Engineering and Technology*, 03, 15068–15075. <https://doi.org/10.15680/IJRSET.2014.0308003>
- Kossenko, A., Lugovskoy, S., Kazanski, B., Astashina, N., & Vagner, E. A. (2013). *Effect of pH on the formation of hydroxyapatite in PEO process with hydrothermal treatment of the Ti alloy Non ferrous alloys strengthening by nanomaterials View project Treatment on Titanium Alloys View project.* <https://www.researchgate.net/publication/272240872>
- Kostelac, L., Pezzato, L., Settimi, A. G., Franceschi, M., Gennari, C., Brunelli, K., Rampazzo, C., & Dabalà, M. (2022). Investigation of hydroxyapatite (HAP) containing coating on grade 2 titanium alloy prepared by plasma electrolytic oxidation (PEO) at low voltage. *Surfaces and Interfaces*, 30. <https://doi.org/10.1016/j.surfin.2022.101888>
- Liu, F., Wang, F., Shimizu, T., Igarashi, K., & Zhao, L. (2005). Formation of hydroxyapatite on Ti-6Al-4V alloy by microarc oxidation and hydrothermal treatment. *Surface and Coatings Technology*, 199(2), 220–224. <https://doi.org/https://doi.org/10.1016/j.surfcoat.2004.10.146>
- Masta, N. (2020). BMPScanningElectronMicroscopy. *BMP.UKI:NM-01-SEM-PFis-I-2020*.



- Morsiya, C. (2020). A review on parameters affecting properties of biomaterial SS 316L. *Australian Journal of Mechanical Engineering*, 20, 1–11. <https://doi.org/10.1080/14484846.2020.1752975>
- Murugan, R., & Ramakrishna, S. (2007). Design strategies of tissue engineering scaffolds with controlled fiber orientation. *Tissue Engineering*, 13(8), 1845–1866. <https://doi.org/10.1089/ten.2006.0078>
- Nikoomanzari, E., Karbasi, M., C.M.A. Melo, W., Moris, H., Babaei, K., Giannakis, S., & Fattah-alhosseini, A. (2022). Impressive strides in antibacterial performance amelioration of Ti-based implants via plasma electrolytic oxidation (PEO): A review of the recent advancements. In *Chemical Engineering Journal* (Vol. 441). Elsevier B.V. <https://doi.org/10.1016/j.cej.2022.136003>
- Pbio, A. (2012). *Abalone, Antara Kesejahteraan dan Ancaman*. <https://pbio.uad.ac.id/abalon-antara-kesejahteraan-dan-ancaman/>
- Permatasari, H. A., Sari, M., Aminatun, Suciati, T., Dahlan, K., & Yusuf, Y. (2021). Nano-carbonated hydroxyapatite precipitation from abalone shell (*Haliotis asinina*) waste as the bioceramics candidate for bone tissue engineering. *Nanomaterials and Nanotechnology*, 11, 1–9. <https://doi.org/10.1177/18479804211032851>
- Purnama, D. (2016). Efek Penambahan Poly(Vinyl Pyrrolidine) (PVP) Pada Variasi Konsentrasi Ca²⁺ dan PO₄³⁻ Dalam Komposit Selulosa Mikrobial-Hidroksiapatit Sebagai Scaffold Untuk Bone Healing. 10–28.
- Qiao, L. P., Lou, J., Zhang, S. F., Qu, B., Chang, W. H., & Zhang, R. F. (2016). The entrance mechanism of calcium and phosphorus elements into micro arc oxidation coatings developed on Ti6Al4V alloy. *Surface and Coatings Technology*, 285, 187–196. <https://doi.org/https://doi.org/10.1016/j.surfcoat.2015.11.041>
- Raghavendra, G. M., Varaprasad, K., & Jayaramudu, T. (2015). Biomaterials: Design, Development and Biomedical Applications. In *Nanotechnology Applications for Tissue Engineering* (hal. 21–44). Elsevier Inc. <https://doi.org/10.1016/B978-0-323-32889-0.00002-9>
- Ratnasari, D., Hermanihadi, S., Indriyanto, W., Fathony, A., H, F. D. W., & R, P. A. (2009). *X-Ray Diffraction (XRD)*. 1–7.
- Ratner, B. D., Hoffman, A. S., Schoen, F. J., Lemons, J. E., Wagner, W. R., Sakiyama-Elbert, S. E., Zhang, G., & Yaszemski, M. J. (2020). *Biomaterials science : an introduction to materials in medicine*.
- Rodriguez-Nieva, J., Bringa, E., Cassidy, T., Johnson, R., Caro, A., Famá, M., Loeffler, M., Baragiola, R., & Farkas, D. (2011). Sputtering from a Porous Material by Penetrating Ions. *The Astrophysical Journal Letters*, 743, L5. <https://doi.org/10.1088/2041-8205/743/1/L5>
- Rujitanapanich, S., Kumpapan, P., & Wanjanoi, P. (2014). Synthesis of hydroxyapatite from oyster shell via precipitation. *Energy Procedia*, 56(C),



- 112–117. <https://doi.org/10.1016/j.egypro.2014.07.138>
- Rusrial, G., & Affi, J. (2018). Analisa Metalurgi Kasus Kegagalan Pelat Logam Implan Untuk Fikasi Patah Tulang Dan Perbandingannya Dengan Logam Implan Baru. *Jurnal Teknik Industri Terintegrasi (JUTIN)*, 1(1).
- Salahshouri, F., Saebnoori, E., Borghei, S., Mossahebi-Mohammadi, M., Bakhsheshi-Rad, H. R., & Berto, F. (2022). Plasma Electrolytic Oxidation (PEO) Coating on γ -TiAl Alloy: Investigation of Bioactivity and Corrosion Behavior in Simulated Body Fluid. *Metals*, 12(11). <https://doi.org/10.3390/met12111866>
- Sari, M., Hening, P., Chotimah, Ana, I. D., & Yusuf, Y. (2021). Bioceramic hydroxyapatite-based scaffold with a porous structure using honeycomb as a natural polymeric Porogen for bone tissue engineering. *Biomaterials Research*, 25(1), 1–13. <https://doi.org/10.1186/s40824-021-00203-z>
- Sari, M., Kristianto, N. A., Chotimah, Ana, I. D., & Yusuf, Y. (2021). Carbonated hydroxyapatite-based honeycomb scaffold coatings on a titanium alloy for bone implant application—physicochemical and mechanical properties analysis. *Coatings*, 11(8). <https://doi.org/10.3390/coatings11080941>
- Sikdar, S., Menezes, P. V., Maccione, R., Jacob, T., & Menezes, P. L. (2021). Plasma electrolytic oxidation (Peo) process—processing, properties, and applications. In *Nanomaterials* (Vol. 11, Nomor 6). MDPI AG. <https://doi.org/10.3390/nano11061375>
- Simchen, F., Sieber, M., Kopp, A., & Lampke, T. (2020). Introduction to plasma electrolytic oxidation—an overview of the process and applications. In *Coatings* (Vol. 10, Nomor 7). MDPI AG. <https://doi.org/10.3390/coatings10070628>
- Siswanto, Hikmawati, D., Benedicta, N., & Nurmala, S. (2020). Synthesis of Hydroxyapatite Based on Nano Coral Using precipitation Method for Bone Substitution. *Journal of Physics: Conference Series*, 1445(1). <https://doi.org/10.1088/1742-6596/1445/1/012015>
- Songur, F., Dikici, B., Niinomi, M., & Arslan, E. (2019). The plasma electrolytic oxidation (PEO) coatings to enhance in-vitro corrosion resistance of Ti–29Nb–13Ta–4.6Zr alloys: The combined effect of duty cycle and the deposition frequency. *Surface and Coatings Technology*, 374, 345–354. <https://doi.org/10.1016/j.surfcoat.2019.06.025>
- Stanishevsky, A. V., & Holliday, S. (2007). Mechanical properties of sol-gel calcium titanate bioceramic coatings on titanium. *Surface and Coatings Technology*, 202(4), 1236–1241. <https://doi.org/https://doi.org/10.1016/j.surfcoat.2007.07.091>
- Wahyu, P., Abi, S., Abi, S., Febrianto, V., & Azis, W. (2017). *ILMU LOGAM PENGENALAN TITANIUM*.
- Wang, Y., Tang, H., Wang, R., Tan, Y., Zhang, H., & Peng, S. (2016). Cathodic voltage-dependent composition, microstructure and corrosion resistance of plasma electrolytic oxidation coatings formed on Zr-4 alloy. *RSC Adv.*, 6.



UNIVERSITAS
GADJAH MADA

PELAPISAN HIDROKSIAPATIT PADA PERMUKAAN TITANIUM (Ti-6Al-4V) BERPORI DENGAN METODE PLASMA

ELECTROLYTIC OXIDATION

Hanif Mahmudah, Prof. Dr. Eng. Yusril Yusuf, S.Si., M.Eng.

Universitas Gadjah Mada, 2023 | Diunduh dari <http://etd.repository.ugm.ac.id/>

<https://doi.org/10.1039/C6RA06197D>

Wei, D., Zhou, Y., Jia, D., & Wang, Y. (2008). Chemical treatment of TiO₂-based coatings formed by plasma electrolytic oxidation in electrolyte containing nano-HA, calcium salts and phosphates for biomedical applications. *Applied Surface Science*, 254(6), 1775–1782.
<https://doi.org/10.1016/j.apsusc.2007.07.144>

Williams, D. F. (1987). Tissue-biomaterial interactions. *Journal of Materials Science*, 22(10), 3421–3445. <https://doi.org/10.1007/BF01161439>

Yu, J. M., Cho, H. R., & Choe, H. C. (2022). Electrochemical characteristics of Sr/Si-doped hydroxyapatite coating on the Ti alloy surface via plasma electrolytic oxidation. *Thin Solid Films*, 746.
<https://doi.org/10.1016/j.tsf.2022.139124>

Yusuf, Y., Khasanah, D. U., Syafaat, F. Y., Pawarangan, I., Sari, M., Mawuntu, V. J., & Rizkayanti, Y. (2019). *Hidroksiapatit Berbahan Dasar Biogenik* (Ifan (ed.)). Gadjah Mada University Press.

Zhang, E., Zhao, X., Hu, J., Wang, R., Fu, S., & Qin, G. (2021). Antibacterial metals and alloys for potential biomedical implants. *Bioactive Materials*, 6(8), 2569–2612. <https://doi.org/https://doi.org/10.1016/j.bioactmat.2021.01.030>