

DAFTAR PUSTAKA

- Adira, R. (2024). PENGARUH KECEPATAN PENARIKAN DAN LUBRIKASI TERHADAP KUALITAS PERMUKAAN DAN MIKROSTRUKTUR PADA PROSES PENARIKAN ALUMINIUM 6061= EFFECT OF WITHDRAWAL SPEED AND LUBRICATION ON SURFACE AND MICROSTRUCTURE QUALITY ON THE 6061 ALUMINUM WITHDRAWAL PROCESS (Doctoral dissertation, Universitas Hasanuddin).
- Ali, A., Chiang, Y. W., & Santos, R. M. (2022). X-ray diffraction techniques for mineral characterization: A review for engineers of the fundamentals, applications, and research directions. *Minerals*, 12(2), 205.
- Ali, N. K., Hashim, M. R., & Aziz, A. A. (2008). Pulse Current Electrochemical Deposition of Silicon for Porous Silicon Capping to Improve Hardness and Stability. *Electrochemical and Solid-State Letters*, 12(3), D11.
- Alizadeh, M., & Cheshmpish, A. (2019). Electrodeposition of Ni-Mo/Al₂O₃ nano-composite coatings at various deposition current densities. *Applied Surface Science*, 466, 433-440.
- Alfarisa, S., Rifai, D. A., & Toruan, P. L. (2018). Studi difraksi sinar-X struktur nano seng oksida (ZnO). *Risalah Fisika*, 2(2), 53-57.
- Aliofkhazraei, M., Walsh, F. C., Zangari, G., Köçkar, H., Alper, M., Rizal, C., ... & Allahyarzadeh, M. H. (2021). Development of electrodeposited multilayer coatings: A review of fabrication, microstructure, properties and applications. *Applied Surface Science Advances*, 6, 100141.
- Andaru Persada Mandiri. (n.d.). *Hardness Tester*. Di akses pada 8 Januari 2025, dari <https://andarupm.co.id/hardness-tester-lab/>
- Andriyanti, W., Prama, H. S., & Priyantoro, D. (2017). Deposisi lapisan tipis titanium nitrida pada stainless steel 316 menggunakan metode DC sputtering.
- Awasthi, S., De, S., & Pandey, S. K. (2024). Electrodeposited carbon nanostructured nickel composite coatings: A review. *Heliyon*.

- Blugan, G., Hadad, M., Graule, T., & Kuebler, J. (2014). Si₃N₄-TiN-SiC three particle phase composites for wear applications. *Ceramics International*, 40(1), 1439-1446.
- Budi, E. (2016). Potensi Pembentukan Lapisan Super dan Ultra Keras Senyawa Komposit Nitrida menggunakan Kaidah Elektrodposisi. *Spektra: Jurnal Fisika dan Aplikasinya*, 1(2), 187-194. (tinggal aluminium kebawah)
- Budi, E., Ksatriotomo, B., Restu, A., Sugihartono, I., & Budi, A. S. (2015). Komposisi dan morfologi permukaan lapisan komposit Ni-TiAlN elektrodposisi. *SEMIRATA* 2015, 2(1).
- Bunaciu, A. A., Udriștioiu, E. G., & Aboul-Enein, H. Y. (2015). X-ray diffraction: instrumentation and applications. *Critical reviews in analytical chemistry*, 45(4), 289-299.
- Chavoshi, S. Z., Brancio, P. S., & An, Q. (2021). Transition Between Hall-Petch and Inverse Hall-Petch Behavior in Nanocrystalline Silicon Carbide. *Physical Review Materials*, 5(7), 073606.
- ChemicalBook. (n.d.). *Characteristics and applications of titanium nitride*. Di akses pada 7 Januari 2025, dari <https://www.chemicalbook.com/article/characteristics-and-applications-of-titanium-nitride.htm>
- Cooke, K. O. (2016). Parametric analysis of electrodeposited nano-composite coatings for abrasive wear resistance. *Electrodeposition of composite materials*.
- Daniel, I. M. (1994). *Engineering Mechanics of Composite Materials*.
- Devega, M., & Dahlan, D. (2015). Rancang Bangun Alat Pembangkit Arus Pulsa Berbasis Mikrokontroler ATmega8535 Elektrodposisi. *Jurnal Fisika Unand*, 4(3).
- Erdoğan, N. N., & Başığit, A. B. (2023). An Approach on Determining MicroStrain and Crystallite Size Values of Thermal Spray Barrier Coated Inconel 601 Super Alloy. *The International Journal of Materials and Engineering Technology*, 6(1), 21-25.

- Fadilah, A. (2024). Pengaruh rapat arus pulsa terhadap pembentukan dan karakterisasi lapisan komposit Ni-TiN/Si₃N₄ dengan metode elektrodeposisi. (Doctoral dissertation, Universitas Negeri Jakarta).
- Fatimah, S., Ragadhita, R., Al Husaeni, D. F., & Nandiyanto, A. B. D. (2022). How to calculate crystallite size from x-ray diffraction (XRD) using Scherrer method. *ASEAN Journal of Science and Engineering*, 2(1), 65-76.
- Fitri, S., Zulhan, Z., & Santoso, I. (2022). Produksi besi dan terak titanium kadar tinggi dari konsentrat pasir besi atau titanomagnetit: Ulasan literatur. *Metalurgi*, 36(3), 119-133.
- Girão, A. V., Caputo, G., & Ferro, M. C. (2017). Application of scanning electron microscopy–energy dispersive X-ray spectroscopy (SEM-EDS). In *Comprehensive analytical chemistry* (Vol. 75, pp. 153-168). Elsevier.
- Grégoire, B., Montero, X., Galetz, M. C., Bonnet, G., & Pedraza, F. (2018). Mechanisms of hot corrosion of pure nickel at 700°C: Influence of testing conditions. *Corrosion Science*, 141, 211-220.
- Gupta, R. N. (2021). Study of pulse electrodeposition parameters for nano YSZ-Ni coatings and its effect on tribological and corrosion characteristics. *Applied Nanoscience*, 11(1), 173-185.
- Gusty, S., Asriadi, M., Idrus, M., Iswady, I., Muslika, M., Yoom, L. I., ... & Putri, M. M. (2024). Korosi dan perlindungan material.
- Hefnawy, A., Elkhoshkhany, N., & Essam, A. (2018). Ni-TiN and Ni-Co-TiN Composite Coatings for Corrosion Protection: Fabrication and Electrochemical Characterization. *Journal of Alloys and Compounds*, 735, 600-606.
- Herdiana, G. (2015). Analisa pengaruh heat treatment material carbide drill rod AF1 terhadap kinerja proses punch. *Jurnal Teknik Mesin (JTM)*, 4(3), 26.
- id.periodic-table.io. (n.d.). Aluminium (Al) - elemen periodik. Di akses pada 16 November 2024, dari <https://id.periodic-table.io/element-13>
- id.periodic-table.io. (n.d.). Nikel (Ni) - elemen periodik. Di akses pada 16 November 2024, from <https://id.periodic-table.io/element-28>

- id.periodic-table.io. (n.d.). Titanium (Ti) - elemen periodik. Diakses pada 16 November 2024, dari <https://id.periodic-table.io/element-22>
- Jayakrishnan, D. S. (2012). Electrodeposition: the versatile technique for nanomaterials. In Corrosion protection and control using nanomaterials (pp. 86-125). Woodhead Publishing.
- Jiang, S. W., Yang, L., Pang, J. N., Lin, H., & Wang, Z. Q. (2016). Electrodeposition of Ni-Al₂O₃ composite coatings with combined addition of SDS and HPB surfactants. *Surface and Coatings Technology*, 286, 197-205.
- John, A., Saeed, A., & Khan, Z. A. (2023). Influence of the duty cycle of pulse electrodeposition-coated Ni-Al₂O₃ nanocomposites on surface roughness properties. *Materials*, 16(6), 2192.
- Jones, R. M. (1999). *Mechanics of Composite Materials* (2nd ed.). CRC Press. <https://doi.org/10.1201/9781498711067>
- Kamil, M. T. (2024). Pengolahan limbah farmasi sulfanilamida menggunakan metode fotokatalisis berbasis material besi (II) oksalat (Doctoral dissertation, Universitas Islam Negeri Maulana Malik Ibrahim).
- Karbasi, M., Yazdian, N., & Vahidian, A. (2012). Development of Electro-CoDeposited Ni-TiC Nano-Particle Reinforced Nanocomposite Coatings. *Surface and Coatings Technology*, 207, 587-593.
- Kartal, M., Buyukbayram, I., Alp, A., & Akbulut, H. (2017). Production of pulse electrodeposited Ni-TiC nanocomposite coatings. *Materials Today: Proceedings*, 4(7), 6982-6989.
- Kejzlar, P., Švec, M., & Macajová, E. (2014). The usage of backscattered electrons in scanning electron microscopy. *Manufacturing Technology*, 14(3), 333-336.
- Khasanah, M. (2015). Desain sistem elektrodposisi untuk proses pelapisan Ni-TiAlN pada substrat tungsten karbida. (Doctoral dissertation, Universitas Negeri Jakarta).
- Kumar, S., Dash, S., & Sahoo, S. K. (2020). TiN-based coatings for biomedical applications: A review. *Materials Today: Proceedings*, 33, 3153-3159.
- Kurlov, A. S., & Gusev, A. I. (2006). Tungsten carbides and WC phase diagram. *Inorganic Materials*, 42(2), 121-127.

- Liu, T., Li, C., Li, Q., Li, L., Xia, F., Xing, H., & Ma, C. (2021). Synthesis and wear characterization of ultrasonic electrodeposited Ni-TiN thin coatings. *International Journal of Electrochemical Science*, 16(1), 151028.
- Masruroh, Manggara, A. B., Papilaka, T., & Triandi, R. (2013). Penentuan ukuran Kristal (crystallite size) Lapisan Tipis PZT dengan Metode XRD melalui Pendekatan Persamaan Debye-Scherrer. *Erudio Journal of Educational Innovation*, 1(2), 24-29.
- Materials Characterization Lab. (n.d.). *XRD Crystallinity by Integration*. University of Utah. Retrieved July 30, 2025, from <https://mcl.mse.utah.edu/xrd-crystallinity-by-integration>
- Maulida, A. B. (2023). Pembentukan Dan Karakterisasi Lapisan Komposit Ni-TiN/AlN/Si₃N₄ Dengan Kaidah Elektrodeposisi Rapat Arus Pulsa. Skripsi. Universitas Negeri Jakarta.
- Meinhold, V., Höhlich, D., Mehner, T., & Lampke, T. (2022). Electrodeposition of thick and crack-free Fe-Cr-Ni coatings from a Cr (III) electrolyte. *Coatings*, 12(1), 56.
- Melciu, D., & Maidee, N. (2015). Pulse-electroplating: Process parameters and their influence on the formed microstructure (Master's thesis).
- Mohammed, A., & Abdullah, A. (2018). Scanning electron microscopy (SEM): A review. In *Proceedings of the 2018 International Conference on Hydraulics and Pneumatics—HERVEX, Băile Govora, Romania* (Vol. 2018, pp. 7-9).
- Mongkolsuttirat, K., & Buajarern, J. (2021). Uncertainty evaluation of crystallite size measurements of nanoparticle using X-Ray Diffraction analysis (XRD). In *Journal of physics: conference series* (Vol. 1719, No. 1, p. 012054). IOP Publishing.
- Natalia, G., Budi, E., & Sugihartono, I. (2023, January). Analisis Morfologi dan Komposisi Lapisan Komposit NI-ALN Dengan Metode Elektrodeposisi Menggunakan Scanning Electron Microscopy-Energy Dispersive Spectroscopy (SEM-EDS). In *PROSIDING SEMINAR NASIONAL FISIKA (E-JOURNAL)* (Vol. 11).

- Naik, S. N., & Walley, S. M. (2020). The Hall–Petch and Inverse Hall–Petch Relations and The Hardness of Nanocrystalline Metals. *Journal of Materials Science*, 55(7), 2661-2681.
- Newbury, D. E., & Ritchie, N. W. (2013). Is scanning electron microscopy/energy dispersive X-ray spectrometry (SEM/EDS) quantitative? *Scanning*, 35(3), 141-168.
- Nixon, W. (1998). History and early developments of the Scanning Electron Microscope within Cambridge University. Department of Engineering, Cambridge University
- Pesić, O., Spasojević, M., Jordović, B., Spasojević, P., & Marčić, A. (2014). Effect of electrodeposition current density on the microstructure and magnetic properties of nickel-cobalt-molybdenum alloy powders. *Science of Sintering*, 46(1), 117-127.
- Putri, M. E., & Wildian, W. (2017). Rancang Bangun Alat Ukur Rapat Arus Elektrodposisi Berbasis Arduino Uno R3 dengan Sensor Efek Hall UGN3503. *Jurnal Fisika Unand*, 6(4), 336–340. <https://doi.org/10.25077/jfu.6.4.336-340.2017>
- PT Tensor. (2024, Februari 17). *Struktur kristal pada material logam*. Diakses pada 10 Desember 2024, dari <https://pttensor.com/2024/02/17/struktur-kristal-pada-material-logam/>
- RAMADHYAGITA, I. L. (2024). PENGARUH VARIASI RAPAT ARUS PULSA TERHADAP KOMPOSISI DAN STRUKTUR MORFOLOGI LAPISAN KOMPOSIT NICKEL SILICON NITRIDE (Ni/Si₃N₄) MENGGUNAKAN METODE ELEKTRODEPOSISI (Doctoral dissertation, UNIVERSITAS NEGERI JAKARTA).
- Ranjan, P., Kurosaki, T., Suematsu, H., Jayaganthan, R., & Sarathi, R. (2020). Formation of tungsten carbide nanoparticles by wire explosion process. *International Journal of Applied Ceramic Technology*, 17(1), 304-310.
- Ren, Y., Zhang, L., Xie, G., Li, Z., Chen, H., Gong, H., ... & Luo, J. (2020). A review on tribology of polymer composite coatings. *Friction*, 9. <https://doi.org/10.1007/s40544-020-0446-4>

- Rishadi, M. (2022). Pengaruh variasi rapat arus terhadap pembentukan dan karakterisasi lapisan komposit Ni-TiN dengan metode elektrodposisi. (Doctoral dissertation, Universitas Negeri Jakarta).
- Ruppi, S. (2005). Deposition, microstructure and properties of texture-controlled CVD α -Al₂O₃ coatings. *International Journal of Refractory Metals and Hard Materials*, 23(4-6), 306-316.
- Sandra, M., Budi, E., & Nasbey, H. (2020, December). Pengaruh variasi temperatur terhadap morfologi berbagai lapisan komposit: Sebuah kajian. *Prosiding Seminar Nasional Fisika (E-Journal*, 9, SNF2020FA-13).
- Saputra, F. M. (2012). Sintesis pigmen magnetik CuFe₂O₄ berbahan dasar pasir besi menggunakan metode kopresipitasi. Semarang: Universitas Negeri Semarang.
- Saputra, R. R., Oediyani, S., Lestari, Y., & Mabruri, E. (2017). Pengaruh Rapat Arus dan Waktu Pelapisan Nikel pada AISI 410 dengan Metode Pulse Electrodeposition terhadap Strukturmikro dan Laju Korosi [The Influences of Current Density and Time on Microstructure and Corrosion Rate Nickel Coating in Aisi 410 by Pulse Electro Deposition Method]. *Metalurgi*, 32(2), 77-82.
- Schlesinger, M., & Paunovic, M. (Eds.). (2011). *Modern electroplating*. John Wiley & Sons.
- Sivasakthi, P., & Sangaranarayanan, M. V. (2019). Influence of pulse and direct current on electrodeposition of NiGd₂O₃ nanocomposite for micro hardness, wear resistance, and corrosion resistance applications. *Composites Communications*, 13, 134-142.
- Sohail, U., Pervaiz, E., Ali, M., Khosa, R., Shakoor, A., & Abdullah, U. (2022). Role of tungsten carbide (WC) and its hybrids in electrochemical water splitting application-A comprehensive review. *FlatChem*, 35, 100404.
- Sujatno, A., Salam, R., Bandriyana, B., & Dimyati, A. (2017). Studi scanning electron microscopy (SEM) untuk karakterisasi proses oksidasi paduan zirkonium. In *Jurnal Forum Nuklir* (Vol. 9, No. 1, pp. 44-50).

- Rishadi, Muhammad. (2022). Pengaruh Variasi Rapat Arus terhadap Pembentukan dan Karakterisasi Lapisan Komposit Ni-TiN dengan Metode Elektrodeposisi. Skripsi. Universitas Negeri Jakarta. Jakarta.
- Tandri, C. (2021). Analisis Pengaruh Temperatur Elektrodeposisi Terhadap Struktur Kristal Lapisan Komposit Ni-TiN-AlN/Si₃N₄. DKI Jakarta, Indonesia: Universitas Negeri Jakarta.
- Theresia, R. (2017). Pengaruh konsentrasi asam borat (H₃BO₃) terhadap lapisan tipis komposit Ni-TiAlN dengan teknik elektrodeposisi. (Doctoral dissertation, Universitas Negeri Jakarta).
- Tidarriano, B. B., Suharno, K., & Mulyaningsih, N. (2019). PENGARUH WAKTU ELEKTROPLATING NIKEL TERHADAP KEKERASAN PADA TANGKI BAHAN BAKAR SEPEDA MOTOR. Jurnal Teknik Mesin MERC (Mechanical Engineering Research Collection), 2(2).
- Triono, Wahyu. (2017). Generator Ozon sebagai Media untuk Sterilisasi Air. Tugas Akhir
- Valério, A., & Morelhao, S. L. (2019). Usage of Scherrer's formula in X-ray diffraction analysis of size distribution in systems of monocrystalline nanoparticles. arXiv preprint arXiv:1911.00701.
- Wahyuningsih, K., Marwoto, P., & Sulhadi. (2013). Konduktivitas dan Transmittansi Film Tipis Zinc Oxide yang Dideposisikan pada Temperatur Ruang. Unnes Physics Journal, 2(1), 37–43.
- Wang, P., Wang, S., Zou, Y., Zhu, J., He, D., Wang, L., & Zhao, Y. (2021). Novel Nitride Materials Synthesized at High Pressure. Crystals, 11(6), 614.
- Wang, Y., & Zhang, L. (2014). Nickel based coatings containing TiN nanoparticles prepared by ultrasonic-electrodeposition technology. Applied Mechanics and Materials, 543, 3703-3706.
- Worsfold, P., Townshend, A., Poole, C. F., & Miró, M. (2019). Encyclopedia of analytical science. Elsevier.
- Wu, M., Jia, W., & Lv, P. (2017). Electrodepositing Ni-TiN nanocomposite layers with applying action of ultrasonic waves. Procedia Engineering, 174, 717-723.

- Xia, F., Li, C., Ma, C., Li, Q., & Xing, H. (2021). Effect of pulse current density on microstructure and wear property of Ni-TiN nanocoatings deposited via pulse electrodeposition. *Applied Surface Science*, 538, 148139.
- Yanlinastuti, Y., Boybul, B., Ginting, A. B., & Anggraini, D. (2016). Pengaruh Parameter Proses Elektrodposisi Terhadap Penentuan Berat Isotop ^{235}U Dalam PEB $\text{U}_3\text{Si}_2/\text{Al}$ Pasca Iradiasi. *Urania: Jurnal Ilmiah Daur Bahan Bakar Nuklir*, 22(2).
- Zhang, H., Wang, J., Chen, S., Wang, H., He, Y., & Ma, C. (2021). Ni-SiC composite coatings with improved wear and corrosion resistance synthesized via ultrasonic electrodeposition. *Ceramics International*, 47(7), 9437-9446.
- Zhang, J., Hu, H., Liu, X., & Li, D. S. (2019). Development of The Applications of Titanium Nitride in Fuel Cells. *Materials today chemistry*, 11, 42-59.
- Zhang, J., Hu, H., Liu, X., & Li, D. S. (2019). Development of the applications of titanium nitride in fuel cells. *Materials Today Chemistry*, 11, 42-59.
- Zhao, Y., & Fan, H. (2021). Effect of pulse parameters on the microstructural evolution and properties of jet electrodeposited Cu- Al_2O_3 nanocomposite coating. *Materials transactions*, 62(6), 726-730.