

DAFTAR PUSTAKA

- Adhani, R., & Husaini. (2017). Logam Berat Sekitar Manusia. Lambung Mangkurat University Press.
- Akbar, N. (2018). *Uji Normalitas Data untuk Penelitian*. Bali: Jayapangus Press.
- Akhtar, N., Rani, M., Mahmood, A., Saba, H., Khan, S., Murtaza, G., Hegazy, H. H., AlObaid, A., Al-Muhimeed, T. I., & Ali, S. (2021). Synthesis and characterization of MXene/ BiCr₂O₄ nanocomposite with excellent electrochemical properties. *Journal of Materials Research and Technology*, 15, 2007–2015. <https://doi.org/10.1016/j.jmrt.2021.08.101>
- Alberty, R. ., & Daniel, F. (1992). Kimia Fisika. Erlangga.
- Alifaturrahma, P., & Hendriyanto, O. (2018). Pemanfaatan Kulit Pisang Kepok Sebagai Adsorben Untuk Menyisihkan Logam Cu. *Jurnal Envirotek*, 8(2), 105–111.
- Andaka, G. (2008). Penurunan Kadar Tembaga Pada Limbah Cair Industri Kerajinan Perak Dengan Presipitasi Menggunakan Natrium Hidroksida. *Jurnal Teknologi*, 1(2), 127–134.
- Anindya, A. L. (2018). Particle Size Analyser: Beberapa Penggunaan Instrumen Hamburan Cahaya. *Seminar Nasional Instrumentasi, Kontrol Dan Otomasi (SNIKO)*, 1, 1–4. <http://journal.citaib.com/sniko/article/view/55>.
- Apriliani, A. (2010). Pemanfaatan Arang Ampas Tebu sebagai Adsorben Ion Logam Cd, Cr, Cu dan Pb dalam Air Limbah. *Repositorio UIN*, 54–56.
- Asrofi, M., Abral, H., Kasim, A., Pratoto, A., Mahardika, M., Park, J. W., & Kim, H. J. (2018). Isolation of Nanocellulose from Water Hyacinth Fiber (WHF) Produced via Digester-Sonication and Its Characterization. *Fibers and Polymers*, 19(8), 1618–1625. <https://doi.org/10.1007/s12221-018-7953-1>.
- Astari, M. A., & Utami, B. (2018). Uji Daya Adsorpsi Adsorben Kombinasi Sekam Padi dan Bagasse Fly Ash untuk Menjerap Logam Cu pada Sistem Batch. *Proceeding Biology Education Conference*, 15(1), 766–774.
- Astuti, W. (2018). Adsorpsi Menggunakan Material Berbasis Lignoselulosa. In

Unnes Press.

- Atkins, P., Paula, J., & Keeler, J. (2018). *Physical Chemistry (11th editi)*. Oxford University Press.
- Basyiruddin, F., Setiawan, A., & Dermawan, D. (2018). Identifikasi Pengaruh pH Terhadap Kemampuan Biosorpsi *Saccharomyces cerevisiae* dalam Mengurangi Kadar Cu. *Conference Proceeding on Waste Treatment Technology*, 1(1), 85–90.
- Baunsele, A. B., & Missa, H. (2020). Kajian Kinetika Adsorpsi Metilen Biru Menggunakan Adsorben Sabut Kelapa. *Akta Kimia Indonesia*, 5(2), 76. <https://doi.org/10.12962/j25493736.v5i2.7791>
- Canra, M., Fadli, A., & Komalasari. (2017). Kinetika Adsorpsi Ion Logam Cu²⁺ Menggunakan Tricalciumphosphate sebagai Adsorben dengan Variasi Kecepatan Pengadukan dan Temperatur. *Jom FTEKNIK Volume 4 No. 2 Oktober 2017*, 1–11.
- Carey, M., & Barsoum, M. W. (2021). MXene polymer nanocomposites: a review. *Materials Today Advances*, 9, 100120. <https://doi.org/10.1016/j.mtadv.2020.100120>.
- Collini, L. (2012). Copper Alloys - Early Applications and Current Performance - Enhancing Processes. In *Copper Alloys - Early Applications and Current Performance - Enhancing Processes*. <https://doi.org/10.5772/1912>.
- Darjito, D., Purwonugroho, D., & Ningsih, R. (2014). The Adsorption of Cr (VI) Ions Using Chitosan-Alumina Adsorbent. *J. Pure App. Chem. Res*, 3(June), 53–61.
- Dong, Y., Sang, D., He, C., Sheng, X., & Lei, L. (2019). Mxene/alginate composites for lead and copper ion removal from aqueous solutions. *RSC Advances*, 9 (50), 29015–29022. <https://doi.org/10.1039/c9ra05251h>.
- Elumalai, S., Yoshimura, M., & Ogawa, M. (2020). Simultaneous Delamination and Rutile Formation on the Surface of Ti₃C₂T_x MXene for Copper Adsorption. *Chemistry - An Asian Journal*, 15(7), 104 - 1051. <https://doi.org/10.1002/asia.202000090>

- Fadhilah, N. F., Wibowo, E. B. T., Astuti, D. H., & Billah, M. (2021). Pemanfaatan Eceng Gondok sebagai Adsorben dengan Perlakuan Awal untuk Menurunkan Kadar Logam Berat Cu. *ChemPro*, 2(01), 7-12. <https://doi.org/10.33005/chempro.v2i01.68>
- Farhan, M. Z. 2022. *Uji Kemampuan Adsorben Nanokomposit MXene/Eceng Gondok dalam Penyisihan Logam Tembaga (Cu) dari Air Limbah Artifisial dengan Variasi Rasio Nanokomposit dan Konsentrasi Adsorbat*. Tugas Akhir. Sarjana. Departemen Teknik Lingkungan Universitas Andalas.
- Fitriyanto, E. B., Soeprobowati, T. R., & Hariyati, R. (2017). Kemampuan Chaetoceros calcitrans (Paulsen) Takano dalam Menurunkan Kadar Logam Berat Tembaga (Cu) pada Limbah Tekstil. *Bioma : Berkala Ilmiah Biologi*, 18(2), 102. <https://doi.org/10.14710/bioma.18.2.102-106>
- Fuad, M. T., Aunurohim, & NurHidayati, T. (2013). Efektivitas Kombinasi *Salvinia molesta* dengan *Hydrilla verticillata* dalam Remediasi Logam Cu pada Limbah Elektroplating. *Jurnal Sains Dan Seni POMITS*, 2(1), 240–246.
- Gan, D., Huang, Q., Dou, J., Huang, H., Chen, J., Liu, M., Wen, Y., Yang, Z., Zhang, X., & Wei, Y. (2020). Bioinspired Functionalization of MXenes ($Ti_3C_2T_x$) with Amino Acids for Efficient Removal of Heavy Metal Ions. *Applied Surface Science*, 504(October), 144603. <https://doi.org/10.1016/j.apsusc.2019.144603>
- Hajar, E. W. I., Sitorus, R. S., Mulianingtias, N., & Welan, F. J. (2016). Efektivitas Adsorpsi Logam Pb^{2+} dan Cd^{2+} Menggunakan Media Adsorben Cangkang Telur Ayam. *Konversi*, 5(1), 1. <https://doi.org/10.20527/k.v5i1.4771>
- Harinaldi. (2005). *Prinsip-Prinsip Statistik Untuk Teknik dan Sains*. Jakarta: Erlangga.
- Herlina, A. 2022. *Uji Kemampuan Adsorben Nanokomposit MXene/Eceng Gondok dalam Penyisihan Logam Berat Cu dari Air Limbah Electroplating dengan Variasi pH dan Rasio Nanokomposit*. Tugas Akhir. Sarjana. Departemen Teknik Lingkungan Universitas Andalas.
- Hoten, H. V. (2020). Analisis Karakterisasi Serbuk Biokeramik Dari Cangkang

Telur Ayam Broiler. *Rotor*, 13(1), 1. <https://doi.org/10.19184/rotor.v13i1.18874>

Jun, B. M., Heo, J., Taheri-Qazvini, N., Park, C. M., & Yoon, Y. (2020). Adsorption of Selected Dyes on $Ti_3C_2T_x$ MXene and Al-based Metal-organic Framework. *Ceramics International*, 46 (3) 2960-2968. <https://doi.org/10.1016/j.ceramint.2019.09.293>.

Jun, B. M., Her, N., Park, C. M., & Yoon, Y. (2020). Effective Removal of Pb (II) from Synthetic Wastewater Using $Ti_3C_2T_x$ MXene. *Environmental Science: Water Research and Technology*, 6(1), 173–180. <https://doi.org/10.1039/c9ew00625g>

Julinawati, Marlina, Nasution, & Sheilatina. (2015). Applying Sem-edx Techniques to Identifying the Types of Mineral of Jades (Giok) Takengon, Aceh. *Jurnal Natural Unsyiah*, 15(2), 44–48.

Kardiman, K., La Ifa, L. I., & Rasyid, R. (2020). Pembuatan Adsorben Dari Sabut Kelapa Sebagai Penyerap Logam Berat Pb (II). *ILTEK : Jurnal Teknologi*, 14(2), 2083–2087. <https://doi.org/10.47398/iltek.v14i2.421>

Karim, N. (2018). Copper and Human Health- A Review. *Journal of Bahria University Medical and Dental College*, 08(02), 117-122. <https://doi.org/10.51985/jbumdc2018046>

Khairuddin, K., Yamin, M., & Kusmiyati, K. (2021). Analisis Kandungan Logam Berat Tembaga (Cu) pada Bandeng (*Chanos chanos* forsk) yang Berasal dari Kampung Melayu Kota Bima. *Jurnal Pijar Mipa*, 16(1), 97–102. <https://doi.org/10.29303/jpm.v16i1.2257>

Kistiyanto, W. P. (2016). *Pengaruh Variasi Temperatur Kalsinasi Pada Sintesa Lithium Mangan Oksida Dengan Rasio MOL Li/Mn 0,8 Terhadap Kemampuan Adsorpsi Lithium Lumpur Sidoarjo*. Institut Teknologi Sepuluh Nopember.

Lima, É. C., Adebayo, M. A., & Machado, F. M. (2015). Kinetic and equilibrium models of adsorption. In *Carbon Nanostructures* (Vol. 0, Issue 9783319188744). https://doi.org/10.1007/978-3-319-18875-1_3.

- Liu, T., Yang, X., Wang, Z. L., & Yan, X. (2013). Enhanced Chitosan BeadsSupported FeO-Nanoparticles for Removal of Heavy Metals from Electroplating 102 Wastewater in Permeable Reactive barriers. *Water Research*, 47(17), 6691– 6700. <https://doi.org/10.1016/j.watres.2013.09.006>.
- Mohamad, E., Oputu, I. J., & Tangio, J. S. (2020). Pemanfaatan Gulma Siam (*Chromolaena odarata* L.) Sebagai Adsorben Logam Timbal. *Jambura Journal of Chemistry*, 2(1), 27–34. <https://doi.org/10.34312/jambchem.v2i1.4528>.
- Muhammad. (2014). Penyerapan β -Karoten Menggunakan Karbon Aktif Tempurung Kelapa Sawit : Kajian Kinetika. *Jurnal Teknologi Kimia Unimal*, 3(2), 53–63.
- Muhid, A. (2019). Analisis Statistik. In *Journal of Chemical Information and Modeling* (Vol. 53, Issue 9).
- Nalendra, A. R. A., Rosalinah, Y., Priadi, A., Subroti, I., Rahayuningsih, R., Lestari, R., Kusamandari, S., Yuliasari, R., Astuti, D., Latumahina, J., Purnomo, M. W., & Zede, V. A. (2021). *Statistika Seri Dasar dengan SPSS*. In Penerbit Media Sains Indonesia.
- Nayono, S. E. (2010). Metode Pengolahan Air Limbah Alternatif Untuk Negara Berkembang. *Inersia*, 6(1), 52–64.
- Neris, J. B., Luzardo, F. H. M., Santos, P. F., De Almeida, O. N., & Velasco, F. G. (2019). Evaluation of Single and Tri-element Adsorption of Pb^{2+} , Ni^{2+} and Zn^{2+} Ions in Aqueous Solution on Modified Water Hyacinth (*Eichhornia crassipes*) Fibers. *Journal of Environmental Chemical Engineering*, 7(1), 102885. <https://doi.org/10.1016/j.jece.2019.102885>
- Nuriadi, Napitupulu, M., & Rahman, N. (2013). Analisis Logam Tembaga (Cu) pada Buangan Limbah Tromol (Tailing) Pertambangan Poboya. *Jurnal Akademika Kimia*, 2(2), 90–96. <http://jurnal.untad.ac.id/jurnal/index.php/JAK/article/view/7732>
- Oyeoka, H. C., Ewulonu, C. M., Nwuzor, I. C., Obele, C. M., & Nwabanne, J. T. (2021). Packaging and Degradability Properties of Polyvinyl Alcohol/Gelatin Nanocomposite Films Filled Water Hyacinth Cellulose Nanocrystals. *Journal*

of Bioresources and Bioproducts, 6(2), 168–185. <https://doi.org/10.1016/j.jobab.2021.02.009>

Patel, H. (2019). Fixed-bed Column Adsorption Study: A Comprehensive Review. *Applied Water Science*, 9(3). <https://doi.org/10.1007/s13201-019-0927-7>

Permata, M. A. D., Purwiyanto, A. I. S., & Diansyah, G. (2018). Kandungan Logam Berat Cu (Tembaga) Dan Pb (Timbal) Pada Air Dan Sedimen Di Kawasan Industri Teluk Lampung, Provinsi Lampung. *Journal of Tropical Marine Science*, 1(1), 7–14. <https://doi.org/10.33019/jour.trop.mar.sci.v1i1.667>

Pinandari, A. W., Fitriana, D. N., Nugraha, A., & Suhartono, E. (2011). Uji Efektifitas Dan Efisiensi Filter Biomassa Menggunakan Sabut Kelapa (Cocos nucifera) Sebagai Bioremival untuk Menurunkan Kadar Logam (Cd, Fe, Cu), Total Padatan Tersuspensi (TSS) dan Meningkatkan pH pada Limbah Air Asam Tambang Batubara. *January*.

Prasetyo, S., Anggoro, S., & Soeprabowati, T. R. (2021). Penurunan Kepadatan Eceng Gondok (*Eichhornia crassipes* (Mart.) Solms) di Danau Rawapening dengan Memanfaatkannya sebagai Bahan Dasar Kompos. *Bioma : Berkala Ilmiah Biologi*, 23(1), 57–62. <https://doi.org/10.14710/bioma.23.1.57-62>.

Priadi, C. R., Anita, A., Sari, P. N., & Moersidik, S. S. (2014). Adsorpsi Logam Seng (Zn) dan Timbal (Pb) pada Limbah Cair Industri Keramik oleh Tanah Liat. *Reaktor*, 15(1), 10. <https://doi.org/10.14710/reaktor.15.1.10-19>.

Pulungan, A. F., & Embun. (2017). Pemanfaatan Pektin dari Kulit Jeruk Manis sebagai Biosorben dalam Menurunkan Kadar Tembaga (Cu) pada Limbah Cair Industri Elektroplating. *Jurnal Ilmiah Farmasi IMELDA*, 1(1), 10–17.

Ramadhan, R. (2016). *Analisis Penyebaran Logam Berat Tembaga (Cu) Pada Air Tanah Dan Aliran Sungai di Sekitar Industri Kerajinan Perak Kotagede Daerah Istimewa Yogyakarta (Issue 1969)*. Universitas Islam Indonesia.

Rasheed, T., Kausar, F., Rizwan, K., Adeel, M., Sher, F., Alwadai, N., & Alshammari, F. H. (2022). Two Dimensional MXenes as Emerging Paradigm for Adsorptive Removal of Toxic Metallic Pollutants from Wastewater.

Chemosphere, 287(P3), 132319. <https://doi.org/10.1016/j.chemosphere.2021.132319>.

Ratnasari, N. D., Moelyaningrum, A. D., & Ellyke, E. (2017). Penurunan Kadar Tembaga (Cu) pada Limbah Cair Industri Elektroplating Menggunakan Cangkang Telur Ayam Potong Teraktivasi Termal. *Sanitasi: Jurnal Kesehatan Lingkungan*, 9(2), 56–62. <https://doi.org/10.29238/sanitasi.v9i2.751>.

Reynolds, T. D., & Richards, P. A. (1996). Unit Operations and Processes in Environmental Engineering 2nd Ed. In *PWS Series in Engineering*.

Melliaroza, M. 2022. *Uji Kemampuan Adsorben Nanokomposit MXene/Eceng Gondok dalam Penyisihan Logam Berat Cu dari Air Limbah Electroplating dengan Variasi Dosis Adsorben dan Rasio Nanokomposit*. Tugas Akhir. Sarjana. Departemen Teknik Lingkungan Universitas Andalas.

Natasya, M. A., Andreas, A., & Putranto, A. (2015). Sintesis Karbon Aktif dari Kulit Salak dengan Aktivasi H₃PO₄ sebagai Adsorben Larutan Zat Warna Metilen Biru. *Prosiding Seminar Nasional Teknik Kimia “Kejuangan,”* 1–7.

Said, N. I. (2018). Metoda Penghilangan Logam Berat (As, Cd, Cr, Ag, Cu, Pb, Ni dan Zn) di Dalam Air Limbah Industri. *Jurnal Air Indonesia*, 6(2), 136–148. <https://doi.org/10.29122/jai.v6i2.2464>.

Sawyer, C. N., McCarty, P. L., & Parkin, G. F. (2002). *Chemistry for Environmental Engineering and Science by (fifth)*. McGraw-Hill.

Seader, J. D., & Henley, E. J. (1998). *Separation Process Principles*. John Wiley & Sons.

Shahzad, A., Rasool, K., Miran, W., Nawaz, M., Jang, J., Mahmoud, K. A., & Lee, D. S. (2017). Two-Dimensional Ti₃C₂Tx MXene Nanosheets for Efficient Copper Removal from Water. *ACS Sustainable Chemistry and Engineering*, 5(12), 11481–11488. <https://doi.org/10.1021/acssuschemeng.7b02695>.

Song, G., Kang, R., Guo, L., Ali, Z., Chen, X., Zhang, Z., Yan, C., Lin, C. Te, Jiang, N., & Yu, J. (2020). Highly Flexible Few-layer Ti₃C₂ MXene/cellulose Nanofiber Heat-spreader Films with Enhanced Thermal Conductivity. *New Journal of Chemistry*, 44(17), 7186–7193. <https://doi.org/10.1039/d0nj00672>

- Somerville, R. (2007). *Low-cost Adsorption Materials for Removal of Metals from Contaminated Water*. 1, 74.
- Sriatun, S. S. et al. (2012). Kimia Unsur. In *Angewandte Chemie International Edition*, 6(11), 951–952.
- Sridhar, P. (1996). Modelling of Affinity Separation by Batch and Fixed Bed Adsorption - A Comparative Study. *Chemical Engineering and Technology*, 19(4), 357–363. <https://doi.org/10.1002/ceat.270190409>
- Supriyantini, E., & Soenardjo, N. (2016). Kandungan Logam Berat Timbal (Pb) Dan Tembaga (Cu) Pada Akar Dan Buah Mangrove Avicennia marina Di Perairan Tanjung Emas Semarang. *Jurnal Kelautan Tropis*, 18(2), 98–106. <https://doi.org/10.14710/jkt.v18i2.520>
- Tan, K. L., & Hameed, B. H. (2017). Insight Into the Adsorption Kinetics Models for The Removal of Contaminants from Aqueous Solutions. *Journal of the Taiwan Institute of Chemical Engineers*, 74, 25–48. <https://doi.org/10.1016/j.jtice.2017.01.024>
- Tang, Y., Yang, C., & Que, W. (2018). A Novel Two-dimensional Accordion Like Titanium Carbide (MXene) for Adsorption of Cr (VI) from Aqueous Solution. *Journal of Advanced Dielectrics*, 8(5). <https://doi.org/10.1142/S2010135X18500352>
- Tanpichai, S., Biswas, S. K., Witayakran, S., & Yano, H. (2019). Water Hyacinth: A Sustainable Lignin-Poor Cellulose Source for the Production of Cellulose Nanofibers. *ACS Sustainable Chemistry and Engineering*, 7(23), 18884–18893. <https://doi.org/10.1021/acssuschemeng.9b04095>
- Tchobanoglous, G., Burton, F. L., & Stensel, H. D. (2003). *Wastewater Engineering Treatment and Reuse (Fourth)*. Metcalf & Eddy Inc.
- Vakili, M., Cagnetta, G., Huang, J., Yu, G., & Yuan, J. (2019). Synthesis and Regeneration of a MXene-based Pollutant Adsorbent by Mechanochemical Methods. *Molecules*, 24(13), 1–11. <https://doi.org/10.3390/molecules24132478>
- Wei, Z., Peigen, Z., Wubian, T., Xia, Q., Yamei, Z., & ZhengMing, S. (2018).

Alkali Treated $Ti_3C_2T_x$ MXenes and Their Dye Adsorption Performance. *Materials Chemistry and Physics*, 206, 270–276. <https://doi.org/10.1016/j.matchemphys.2017.12.034>

Wijayanto, S. O., & A.P Bayuseno. (2013). Analisis Kegagalan Material Pipa Ferrule Nickel Alloy N06025 Pada Waste Heat Boiler Akibat Suhu Tinggi Berdasarkan Pengujian : Mikrografi Dan Kekerasan. *Jurnal Teknik Mesin Undip*, 1(4), 33–39.

Xiao, Z., Ruan, S., Kong, L. B., Que, W., Zhou, K., Liu, Y., & Zhang, T. (2020). *MXenes and MXenes-based Composites*.

Xiang, J., Wang, X., Ding, M., Tang, X., Zhang, S., Zhang, X., & Xie, Z. (2022). The Role of Lateral Size of MXene Nanosheets in Membrane Filtration of Dyeing Wastewater: Membrane Characteristic and Performance. *Chemosphere*, 294, 133728. <https://doi.org/10.1016/j.chemosphere.2022.133728>

Ying, Y., Liu, Y., Wang, X., Mao, Y., Cao, W., Hu, P., & Peng, X. (2015). Two Dimensional Titanium Carbide for Efficiently Reductive Removal of Highly Toxic Chromium (VI) from Water. *ACS Applied Materials and Interfaces*, 7(3), 1795–1803. <https://doi.org/10.1021/am5074722>