



DAFTAR PUSTAKA

- Agnestisia, R., Komari, N., dan Sunardi, 2012, Adsorpsi Fosfat (PO_4^{3-}) Menggunakan Selulosa Purun Tikus (*Eleocharis dulcis*) Termodifikasi Heksadesilmelammonium Bromida (HDTMABr), *Sains dan Terapan Kimia*, 6(1), 71–86.
- Ahalya, N., Ramachandra, T.V., dan Kanamadi, R.D., 2003, Biosorption of Heavy Metal, *Res. J. Chem. Environ.*, 7(4), 71–79.
- Akpomie, K.G., Dawodu, F.A., and Adebowale, K.O., 2015, Mechanism on the Sorption of Heavy Metals from Binary-Solution by a Low Cost Montmorillonite and its Desorption Potential, *Alex. Eng. J.*, 54, 757–767.
- Akpoveta, O.V. and Osakwe, S.A., 2014, Determination of Heavy Metal Contents in Refined Petroleum Products, *J. Appl. Chem.*, 6 (7), 1–2.
- Alloreung, dan David, 2010, *Budidaya Kelapa Sawit*, Aska Media, Bogor.
- Alghamdi, A.A., Al-Odayni, A.B., Saeed, W.S., Al-Kahtani, A., Alharthi, F.A., and Aouak, T., 2020, Efficient Adsorption of Lead (II) from Aqueous Phase Solutions Using Polypyrrole-Based Activated Carbon, *Materials.*, 12, 1–16.
- Ali, M. F., dan Abbas, S., 2006, A Review of Methods for The Demetallization of Residual Fuel Oils, *Fuel Proces. Technol.*, 87(7), 573–584.
- Anggraini, D., dan Roliadi, H., 2011, Pembuatan Pulp dari Tandan Kosong Kelapa Sawit untuk Karton pada Skala Usaha Kecil, *Jurnal Penelitian Hasil Hutan*, 29(3), 217–221.
- Asparingga, H., Syahbanu, I., dan Alimuddin., A.H., 2018, Pengaruh Volume Anhidrida Asetat pada Sintesis Selulosa Asetat dari Sabut Kelapa (*Cocos nucifera L.*), *Jurnal Kimia Khatulistiwa*, 7(3), 10–17.
- Atkins, P.W., 1997, *Kimia Fisika 2*, Erlangga, Jakarta.
- Branvall, E., Mazeikiene, A., Valentukeviciene, M., 2006, Experimental Research on Sorption of Petroleum Products from Water by Natural Clinoptilolite and Vermiculite, *Geologija*, 56, 5–12.
- Budhiarto, A., 2009, *Buku Pintar Migas Indonesia*, Balai Pustaka, Jakarta.
- Cha, C.Y., Boysen, J.E., dan Branthaver, J.F., 1991, *Process for Removing Heavy Metal Compounds from Heavy Crude Oil*, US Patent 5041209 to Western Research Institute.
- Damanik, T.A., 2016, Kemampuan Alfa Selulosa dari Sabut Kelapa Hijau (*Cocosnucifera L.*) sebagai Bioadsorben Logam Berat Cadmium (Cd), *Skripsi*, Jurusan Biologi Fakultas Teknobiologi UAJY, Yogyakarta.
- Dawber, J.G., dan Moore, A.T., 1980, *Chemistry for the Life Science*, MacMillan Education Ltd., London.
- Djunaidi, M.C., Wibawa, P.J., dan Suseno, A., 2020, Pengenalan Metode Adsorpsi Logam Fe (III) Menggunakan Selulosa dan Selulosa Asetat dari Serbuk Gergaji Kayu Kepada Siswa SMA Al-Azhar 14 Semarang, *Prosiding Seminar Nasional*, UNDIP, Semarang.



- Fergusson, J.E., 1990, *The Heavy Elements: Chemistry, Environmental Impact and Health Effects*, Pergamon, Oxford.
- Fessenden, R.J., dan Fessenden, J.S., 1999, *Kimia Organik Edisi Ketiga Jilid Kedua*, Erlangga, Jakarta.
- Fiona, P.R., Eva, L.M., dan Yusuf, M.T., 2012, Pembuatan Surfaktan Natrium Lignosulfonat dari Tandan Kosong Kelapa Sawit dengan Sulfonasi Langsung, *J. Tek. Kim.*, 1(18), 41–46.
- Flores, V., dan Cabassud, C., 1999, A Hybrid Membrane Process for Cu(II) Removal from Industrial Wastewater, Comparison With A Conventional Process System, *Desalination*, 126, 101–108.
- Galiwango, E., Rahman, N.S.A., Al-Marzouqi, A.H., Abu-Qomar, M.M., and Khaleel, A.A., 2019, Isolation and Characterization of Cellulose and α -Cellulose from Date Palm Biomass Waste, *Heliyon*, 12 (5), 02937.
- Ganstrom, M., 2009, *Cellulose Derivatives: Synthesis, Properties, and Applications*, Helsinki Printing House, Helsinki.
- Gawel, I., Bociaska, D., dan Biskupski, P., 2005, Effects of Asphaltene on Hydroprocessing of Heavy Oils and Residua, *Applied Catalysis*, 295, 89–94.
- Ginting, F.D., 2008, *Adsorpsi*, UI Press, Jakarta.
- Habibah, R., Nasution, D. Y., dan Muis, Y., 2013, Penentuan Berat Molekul dan Derajat Polimerisasi α -Selulosa yang Berasal dari Alang – Alang (*Imperata cylindrica*) dengan Metode Viskositas, *Jurnal Sintia Kimia*, 1(2), 1–6.
- Halim, E.S., 2014, Chemical Modification of Cellulose Extracted from Sugarcane Bagasse: Preparation of Hydroxyethyl Cellulose, *Arab. J. Chem.*, 7, 362–371.
- Hajeeth, T., Vijayalakshmi, K., Gomathi, T., Sudha, P., dan Anbalagan, S., 2007, Adsorption of Copper(II) and Nickel(II) Ions from Aqueous Solution Using Graft Copolymer of Cellulose Extracted from the Sisal Fiber with Acrylic Acid Monomer, *Composite Interface*, 21(1), 75–86.
- Hendaryati, D.D., dan Arianto, Y., 2016, *Statistik Perkebunan Indonesia Komoditas Kelapa Sawit 2015-2017*, Direktorat Jendral Perkebunan, Jakarta.
- Hegazi, H.A., 2013, Removal of Heavy Metals from Wasterwater Using Agricultural and Industrial Wastes as Adsorbents, *J.Civ.Eng.Constr.Technol.* 9, 276–282.
- Hermiati, E., Risanto, L., Anita, S.H., Aristiawan, Y., dan Sudiyani, Y., 2014, Sakarifikasi Serat Tandan Kosong dan Pelepas Kelapa Sawit setelah Pretreatment Menggunakan Kultur Campuran Jamur Pelapuk Putih *Phanerochaete chrysosporium* dan *Trametes versicolor*, *Jurnal Penelitian Hasil Hutan*, 32(2), 111–122.
- Hossain, M.A., Ngo, H.H., Guo, W.S., and Nguyen, T.V., 2012, Removal of Copper from Water by Adsorption onto Banana Peel as Bioadsorbent, *Int. J. Geomate*, 2 (2), 227–234.
- Indarti, S., 2014, *Outlook Komoditi Kelapa Sawit, Pusat Data dan Sistem Informasi Pertanian Sekretariat Jenderal-Kementerian Pertanian*, Jakarta.



- Jadoon, S., Amin, A.A., Mahmood, H.K., Hamoodi, D.A., and Sabir, M.F.M., 2016, Determination of Trace Metals in Crude Oils by Atomic Absorption Spectrophotometry in Khurmala and Guwayar Oil Fields of Kurdistan Region, Iraq, *Am. Sci. Res. J. Eng., Technol., Sci.*, 1 (20), 213–223.
- Jang-Soon, K., Seong-Taek, W., Jong-Hwa, L., Soon-Oh, K., dan Ho-Young, J., 2010, Removal of Divalent Heavy Metals (Cd, Cu, Pb, dan Zn) and Arsenic (III) From Aqueous Solutions Using Scoria: Kinetics and Equilibria of Sorption, *J. Hazardous Materials*, 174(1-3), 307–313.
- Jingxian, W., 2020, *Studies of Oxidative Degradation of Biomass in Alkaline Water*, Kyushu University Institutional Repository, Fukuoka.
- Kasim, F., Syamsu, K., Setyaningsih, D., Suryadarma, P., and Sudirman, 2019, Isolation of α -cellulose from Oil Palm Waste Biomass as a Raw Material of Nanocrystalline Cellulose (NCC), *Int. J. Adv. Sci. Eng. Inf. Technol.*, 4 (9), 1395–1401.
- Khan, Z., Javed, F., Shamair, Z., Hafeez, A., Fazal, T., Aslam, A., Zimmerman, W.B., dan Rehman, F., 2021, Current Developments in Esterification Reaction: A Review on Process and Parameters, *J. Ind. Eng. Chem*, 103(25), 80–101.
- Khor, K.H., Lim, K.O., dan Zainal, Z.A., 2009, Characterization of Bio-Oil: A By-Product from Slow Pyrolysis of Palm Empty Fruit Bunches, *Am. J. Applied Sciences.*, 6(9), 1647–1652.
- Kirk, R.E., Othmer, D.F., Grayson, M., dan Eckroth, D., 2004, *Kirk-Othmer Encyclopedia of Chemical Technology*, John Wiley & Sons, New York.
- Kratochvil, D., dan Volesky, B., 1998, Advances in The Biosorption of Heavy Metals, *Trends Biotechnol*, 16(7), 291–300.
- Kukwa, D.T., Ikyereve, R.E., Adejo, S.O., and Ikese, C.O., 2014, Kinetics of Nickel Vanadium Adsorption from Crude Oil onto NH₄Cl-Modified Primitive Clay, *Int. J. Eng. Sci.*, 4 (3) , 13–20.
- Kumolo, S.T., Yulizar, Y., Haerudin, H., Kurniawaty, I., dan Apriandani, D.O.B., 2017, Identification of Metal Porphyrins in Duri Crude Oil, *Mater. Sci. Eng.*, 496, 012038.
- Lavanya, D., Kulkarni, P.K., Dixit, M., Raavi, PK., dan Krishna, N.V., 2011, Sources of Cellulose and Their Applications, *Int. J. Drug. Dev. Res.*, 6 (2), 20–38.
- Leandro, V.A.G., Freitas, R., and Gil, L.F., 2008, Adsorption of Cu (II), Cd (II), and Pb (II) from aqueous single metal solutions by cellulose and mercerized cellulose chemically modified with succinic anhydride, *Carbohydr. Polym.*, 74 (4), 922–929.
- Liu, Z., Zhang, Z., Liu, P., Zhai, J., dan Yang, C., 2015, Iron Contamination Mechanism and Reaction Performance Research on FCC Catalyst, *J. Nanotechnol.*, 1–6.
- Masruhin, M., Rasyid, R., dan Yani, S., 2018, Penyerapan Logam Berat Timbal (Pb) dengan Menggunakan Lignin Hasil Isolasi Jerami Padi, *J. Chem. Process. Eng.*, 1 (3), 11–20.



- Metecalf, C.L., dan Eddy, I.N.C., 1979, *Wasterwater Engineering: Treatment, Disposal and Reuse*, McGraw-Hill Publishing Company, New York.
- Misran, E., 2009, Pemanfaatan Kulit Buah Kakao dan Kulit Kopi sebagai Adsorben Ion Pb dalam Larutan, *MIPA Eduk.*, 12 (1), 23–29.
- Ni'mah, Y.L., dan Ita, U., 2007, Penurunan Kadar Tembaga dalam Larutan dengan Menggunakan Biomassa Bulu Ayam, *Jurnal Kimia*, 2(1), 57–66.
- Ningsih, Y.A., Lubis, K.R., dan Moeskin, R., 2012, Pembuatan Bioetanol Dari Tandan Kosong Kelapa Sawit (TKKS) Dengan Metode Hidrolisis Asam Dan Fermentasi, *J. Tek. Kim.*, 1(18), 31.
- Rahmalia, W., Yulistira, F., Ningrum, J., Qurbaniah, M., dan Ismadi, M., 2015, Pemanfaatan Potensi Tandan Kosong Kelapa Sawit (*Elais guineensis Jacq*) sebagai Bahan Dasar C-Aktif untuk Adsorpsi Logam Perak dalam Larutan, *PKMP*, 3(13), 1–10.
- Rahmi, R., dan Sajidah, 2017, Pemanfaatan Adsorben Alami (Biosorben) Untuk Mengurangi Kadar Timbal (Pb) Dalam Limbah Cair, *Prosiding Seminar Nasional*, UIN Ar-Raniry, Banda Aceh.
- Ramos, S.N.C., Xavier, A.L.P., Teodoro, F. S., Gil, L. F., dan Gurgel, L.V. A., 2016, Removal of Cobalt(II), Copper(II), and Nickel(II) Ions from Aqueous Solutions using Phthalate functionalized Sugarcane Bagasse: Mono- and Multicomponent Adsorption in Batch Mode. *Ind.l Crops. Prod.*, 79, 116–130.
- Rana, M.S., Samano, V., Ancheyta, J., dan Diaz, J.A.I., 2007, A Review of Recent Advances on Process Technologies for Upgrading of Heavy Oils and Residua, *Fuel*, 86(9), 1216–1231.
- Rio, J.C.D., Rencoret, J., Gutierrez, A., Elder, T., Kim, H., and Ralph, J., 2020, Lignin Monomers from Beyond the Canonical Monolignol Biosynthetic Pathway: Another Brick in the Wall, *ACS Sustain. Chem. Eng.*, 8(13), 4997–5012.
- Rivai, H., Hamdani, A.S., Ramdani, R., Lalfari, R.S., Andayani, R., Armin, F., and Djamaan, A., 2018, Production and Characterization of Alpha Cellulose Derived From Rice Straw (*Oryza sativa* L.), *Int. J. Pharm. Sci. Rev. Res.*, 52 (1), 45–48.
- Roni, K.A., 2020, *Teknologi Minyak Bumi*, Rafah Press, Palembang.
- Rowell, R.M., 2005, *Chemical Modification of Wood. Handbook of Wood Chemistry and Wood Composites*, CRC Press, Florida.
- Saragih, S.A., 2008, Pembuatan dan Karakterisasi Karbon Aktif dari Batubara Riau Sebagai Adsorben, *Tesis*, Jurusan Teknik Mesin FT UI, Jakarta.
- Sene, C.F., McCan, M.C., Wilson, R.H., dan Grinter, R., 1994, Fourier-transform Raman and Fourier-transform Infrared Spectroscopy (An Investigation of Five Higher Plant Cell Walls and Their Components), *Plant Physiology*, 106(4), 1623–1631.
- Siddiqui, M.N., Ali, M.F., Al-Malki, A., El-Ali, B., dan Martinie, G., 2006, Deep Desulphurization of Gasoline and Diesel Fuels Using Non-Hydrogen Consuming Techniques, *Fuel*, (10-11), 1354–1363.
- Smith, K.J., dan Lai, W.C., 2001, Heavy Oil Microfiltration Using Ceramic Monolith Membranes, *Fuel*, 80, 1121–1130.



- Soerawidjaja, T.H., 2006, Fondasi-Fondasi Ilmiah dan Keteknikan dari Teknologi Pembuatan Biodiesel, Handout Seminar Nasional Biodiesel Sebagai Energi Alternatif Masa Depan, *Prosiding Seminar Nasional*, UGM, Yogyakarta.
- Speight, J.G., 1991, *The Chemistry and Technology of Petroleum*, Marcel Dekker Inc., New York.
- Stumm, W., dan Morgan, J., 1996, *Aquatic Chemistry*, John Wiley and Sons, Inc., Canada.
- Sudiyani, Y., 2009, Utilization of Biomass Waste Empty Fruit Bunch Fiber of Palm Oil for Bioethanol Production, *Research Workshop on Sustainable Biofuel*, Jakarta.
- Sun, J.X., Sun, X.F., Zhao, H., and Sun, R.C., 2004, Isolation and Characterization of Cellulose from Sugarcane Bagasse, *Polym. Degrad. Stab.*, 84(2), 331–339.
- Suryadi, H., Sutriyo., and Fauziah, G., 2019, Characterization Sodium Carboxymethyl Cellulose from Alpha Cellulose Betung Bambooo (*Dendrocalamus asper*), *J. Pharmacogn*, 11 (5), 894–900.
- Syauqiah, I., Amalia, M., dan Kartini, H.A., 2011, Analisis Variasi Waktu dan Kecepatan Pengaduk Pada Proses Adsorpsi Limbah Logam Berat dengan Arang Aktif, *INFO TEKNIK*, 12(1), 11–20.
- Sjostrom, E., 1993, *Wood Chemistry: Fundamental and Applications 2nd ed*, Academic Press, San Diego.
- Thanh, N.D., dan Nhung, H.L., 2009, *Cellulose Modified with Citric Acid and Its Absorption of Pb²⁺ and Cd²⁺ Ions*, ECSOC, Hanoi.
- Tristantini, D., Dewanti, D.P., and Sandra, C., 2017, Isolation and Characterization of α -Cellulose from Blank Bunches of Palm Oil and Dry Jackfruit Leaves with Alkaline Process NaOH Continued with Bleaching Process H₂O₂, *Appl. Phys. Lett.*, 1 , 5011858.
- Vemmy, N.A.P., dan Ade, S.S., 2020, Penentuan Suhu Optimum Bottom Column dalam Pemurnian Triasetin Menggunakan Simulasi Chemcad 7.1.5, *Distilat*, 6(1), 13–20.
- Wiyantoko, B., 2016, *Modul Kuliah Kimia Petroleum*, UII Press, Yogyakarta.
- Yakubu, A., Tanko, M., Umar, Sani, dan Mohammed, S.D., 2011, Chemical Modification of Microcrystalline Cellulose: Improvement of Barrier Surface Properties to Enhance Surface Interaction with Some Synthetic Polymers for Biodegradable Packaging Material Processing and Applications in Textile, Food, and Pharmaceutical Industry, *Advance in App. Sci. Res.*, 2(6), 532–540.
- Yu, J., Li, Z., Ye, Q., Yang, Y., and Chen, S., 2010, Development of Succinic Acid Production from Corncob Hydrolysate by *Actinobacillus succinogenes*, *J. Ind. Microbiol. Biotechnol.*, 10 (37), 1033–1040.
- Yue, X., Huang, J., Jiang, F., Lin, H., and Chen, Y., 2019, Synthesis and Characterization of Cellulose-Based Adsorbent for Removal of Anionic and Cationic Dyes, *J. Eng. Fibers Fabr.*, 14, 10.1177.
- Zeferino, R.C.F., Piaia, V.A.A., Orso, V.T., Pinheiro, V.M., Zanetti, M., Colpani, G.L., Padoin, N., Soares, C., Fiori, M.A., dan Riella, H.G., 2022,



UNIVERSITAS
GADJAH MADA

Sintesis Selulosa Asetat dari Tandan Kosong Kelapa Sawit Melalui Reaksi Esterifikasi dan Aplikasinya
Sebagai Adsorben Logam Berat dalam Fraksi Berat Minyak Bumi
Sulthan Dzaky Pratama Putra, Prof. Drs. Jumina, Ph.D.; Respati Tri Swasono, S.Si., M.Phil., Ph.D.
Universitas Gadjah Mada, 2024 | Diunduh dari <http://etd.repository.ugm.ac.id/>

Neryl acetate synthesis from nerol esterification with acetic anhydride by heterogeneous catalysis using ion exchange resin, *J. Ind. Eng. Chem.*, 105 (1), 121–131.

Zhou, Y., Stuart-Williams, H., Farquhar, G.D., Hocart, C.H., 2010, The Use of Natural Abundance Stable Isotopic Ratio to Indicate the Presence of Oxygen-Containing Chemical Linkages between Cellulose and Lignin in Plant Cell Walls, *Phytochemistry*, (71), 982–993.