

DAFTAR PUSTAKA

- Abosadiya, H. M., Hasbullah, S. A., & Yamin, B. M. (2015). Synthesis, Crystal Structure and Antioxidant Evaluation of C-4-Acetamidophenylcalix [4] Pyrogallolarene. In *AIP Conference Proceedings* (Vol. 1678, No. 1, p. 050024). AIP Publishing LLC.
- Anugrahwati, M., Fajarwati, F. I., & Safitri, R. A. (2021). Adsorpsi Pb (II) dari Air dengan Karbon Aktif dari Kulit Salak Pondoh: Kinetika dan Isoterm Adsorpsi. *Indonesian Journal of Chemical Research*, 6(1), 1-11.
- Aryanti, L. (2011). Pemanfaatan Rumput Laut Sargassum Sp. Sebagai Adsorben Limbah Cair Industri Rumah Tangga Perikanan. *Skripsi*. Bogor : Fakultas Perikanan Dan Ilmu Kelautan Institut Pertanian Bogor
- Ashar, T., Santi, D. N., & Naria, E. (2013). Kromium, Timbal, dan Merkuri dalam Air Sumur Masyarakat di Sekitar Tempat Pembuangan Akhir Sampah. *Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*, 7(9), 408-414.
- Atkins, P. W. (1999). *Kimia Fisika Jilid 2*. Jakarta: Erlangga.
- Attar, K., Demey, H., Bouazza, D., & Sastre, A. M. (2019). Sorption and Desorption Studies of Pb (II) and Ni (II) from Aqueous Solutions by A New Composite Based on Alginate and Magadiite Materials. *Polymers*, 11(2), 340.
- Azmi, S. N. H., Al-Balushi, M., Al-Siyabi, F., Al-Hinai, N., & Khurshid, S. (2020). Adsorptive Removal of Pb (II) Ions from Groundwater Samples in Oman Using Carbonized Phoenix Dactylifera Seed (Date stone). *Journal of King Saud University-Science*, 32(7), 2931-2938.
- Castellan, G.W. (1982). *Physical Chemistry. Third Edition*. General Graphic Service. New York.
- Crawford, C. B., & Quinn, B. (2017). The Interactions of Microplastics and Chemical Pollutants. *Microplastic Pollutants*, 131–157.
- Dalgarno, S. J., Power, N. P., Warren, J. E., & Atwood, J. L. (2008). Rapid Formation of Metal–Organic Nano-Capsules Gives New Insight into the Self-assembly Process. *Chemical Communications*, (13), 1539-1541.
- Day, R. A, A L. Underwood. (1999). *Analisis Kimia Kuantitatif, Edisi Kelima*. Jakarta : Erlangga.
- Deakyne, C. A., & Adams, J. E. (2017). *Computational Studies of Supramolecular Systems: Resorcinarenes and Pyrogallolarenes*.
- Deng, S., Wang, P., Zhang, G., & Dou, Y. (2016). Polyacrylonitrile-Based Fiber Modified With Thiosemicarbazide By Microwave Irradiation and Its

- Adsorption Behavior for Cd (II) and Pb (II). *Journal of Hazardous Materials*, 307, 64-72.
- Ewing, G. W. (1997). *Analytical Instrumentation Handbook 2nd edition*. USA: CRC Press.
- Freundlich, H. M. F. (1906). Over the Adsorption In Solution. *J. Phys. chem.*, 57(385471), 1100-1107.
- Gandjar, I. G., & Rohman, A. (2007). *Kimia Farmasi Analisis*. Yogyakarta : Pustaka Pelajar, 224, 228
- Gregg, S.J. and Sing, K.S.W. (1982). *Adsorpsi, Surface and Porosity, 2 ed.* London: Academic Press.
- Gritter, R.J, Bobbitt, J.N., dan Schwarting, A.E. (1991). *Pengantar Kromatografi. diterjemahkan oleh Kosasih Padmawinata. Edisi II*. Bandung: ITB Press Bandung.
- Gutsche, C. D. (1998). *Calixarenes Revisited*. Cambridge: Royal Society of Chemistry.
- Handayani, S. N., Irmanto, & Indriyani, N. N. (2020). Removal of Rhodamine B Using 4-hydroxy-3-methoxyphenylcalix[4]resorcinarene. In *Journal of Physics: Conference Series* (Vol. 1494, No. 1, p. 012022). IOP Publishing.
- Handayanto, E., Nuraini, Y., Muddarisna, N., Syam, N., & Fiqri, A. (2017). *Fitoremediasi dan Phytomining Logam Berat Pencemar Tanah*. Universitas Brawijaya Press.
- Hardjono Sastrohamidjojo. (1991). *Spektroskopi*. Yogyakarta : Liberty.
- Harizal, Jumina., & Wahyuningsih, T. D. (2018). Sintesis, Serapan Elektronik, dan Fotostabilitas Senyawa C-4-benziloksfenilkalis[4]pirogalarena Dodekabenoat. *Forum Ilmiah Volume 15 Nomor 3, September 2018*.
- Hart, H., Craine, L., & Hart, D. (2003). *Kimia Organik, Suatu Kuliah Singkat Edisi Kesebelas*. Jakarta: Erlangga.
- Hasan, A., Yerizam, M., & Yahya, M. H. (2021). Mekanisme Adsorben Zeolit dan Manganese Zeolit Terhadap Logam Besi (Fe). *Jurnal Kinetika*. 12(1). 9–17.
- Hidayat, Danny. N. W. (2021). Sintesis dan Uji Aktivitas Senyawa C-4-hidroksi-3-metoksifenilkalis [4]pirogalarena sebagai Adsorben Logam Berat Nikel dan Besi. *Skripsi*. Yogyakarta : Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Gadjah Mada.
- Heiba, H. F., Taha, A. A., Mostafa, A. R., Mohamed, L. A., & Fahmy, M. A. (2020). Preparation and Characterization of Novel Mesoporous Chitin Blended MoO₃-Montmorillonite Nanocomposite for Cu (II) and Pb (II) Immobilization. *International Journal of Biological Macromolecules*, 152, 554-566.

- Ho, Y. S., McKay, G., Wase, D. A. J., & Forster, C. F. (2000). Study of the Sorption of Divalent Metal Ions on To Peat. *Adsorption Science & Technology*, 18(7), 639-650.
- Husni, H. & Rosnelly, C.M. (2007). Studi Kinetika Adsorpsi Larutan Logam Timbal (Pb) Menggunakan Karbon Aktif dari Batang Pisang. *Jurnal Hasil Penelitian Industri*, 20(1), 1-10.
- Issabayeva, G., Aroua, M.K., and Sulaiman N.M.N. (2005). Removal of Lead from Aqueous Solutions on Palm Shell Activated Carbon. *Bioresource Technology*, 97, 2350–2355.
- Ji, J., Chen, G., & Zhao, J. (2019). Preparation and Characterization of Amino/Thiol Bifunctionalized Magnetic Nanoadsorbent and its Application in Rapid Removal of Pb (II) from Aqueous System. *Journal of Hazardous Materials*, 368, 255-263.
- Jumina, Priastomo, Y., Setiawan, H. R., Kurniawan, Y. S., & Ohto, K. (2020). Simultaneous Removal of Lead (II), Chromium (III), and Copper (II) Heavy Metal Ions Through an Adsorption Process using C-phenylcalix[4]pyrogallolarene Material. *Journal of Environmental Chemical Engineering*, 103971.
- Jumina, S., Siswanta, D., Nofiaty, K., Imawan, A. C., Priastomo, Y., & Ohto, K. (2019). Synthesis of C-4-Hydroxy-3-Methoxyphenylcalix [4] Resorcinarene and Its Application as Adsorbent for Lead (II), Copper (II) and Chromium (III). *Bull. Chem. Soc. Jpn*, 92, 825-831.
- Junita, L. N. (2013). Profil Penyebaran Logam Berat Di Sekitar TPA Pakusari Jember. *Skripsi*. Jember : Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Negeri Jember.
- Karapinar, H. S., Kilicel, F., Ozel, F., & Sarilmaz, A. (2021). Fast and Effective Removal of Pb (II), Cu (II) and Ni (II) Ions from Aqueous Solutions with TiO₂ Nanofibers: Synthesis, Adsorption-desorption Process and Kinetic Studies. *International Journal of Environmental Analytical Chemistry*, 1-21.
- Khopkar, S.M.. (1990). *Konsep Dasar Kimia Analitik*. Jakarta: UI Press.
- Kim, S. K., Kang, B. G., Koh, H. S., Yoon, Y. J., Jung, S. J., Jeong, B., ... & Yoon, J. (2004). A New Imidazolium Cavitand for the Recognition of Dicarboxylates. *Organic Letters*, 6(25), 4655-4658.
- Kumari, Harshita & Atwood, Jerry. (2017). *Pyrogallol[4]arenes in Self-Assembly*. 10.1016/B978-0-12-409547-2.12580-6.
- Lagergren, S. K. (1898). About the Theory of So-Called Adsorption of Soluble Substances. *Sven. Vetenskapsakad. Handingar*, 24, 1-39.
- Langmuir, I. (1918). The Adsorption Of Gases On Plane Surfaces Of Glass, Mica and Platinum. *Journal of the American Chemical society*, 40(9), 1361-1403.

- Latupeirissa, J., Tanasale, M. F., & Musa, S. H. (2018). Kinetika Adsorpsi Zat Warna Metilen Biru oleh Karbon Aktif dari Kulit Kemiri (*Aleurites moluccana* (L) Willd). *Indonesian Journal of Chemical Research*, 6(1), 12-21.
- Morikawa, O., Iyama, E., Oikawa, T., Kobayashi, K., & Konishi, H. (2006). Conformational Properties of C₂v-symmetrical Resorcin[4]arene tetraethers. *Journal of Physical Organic Chemistry*, 19(3), 214-218.
- National Pollutant Inventory AU. (2018). *Lead and Compounds*. Diakses pada 11 November 2021 dari <http://www.npi.gov.au/resource/lead-compounds>
- Ngaeni, Nur Siti. (2019). Sintesis Senyawa C-4-hidroksifenilikals[4]resorsinarena dengan Metode Grinding dan Aplikasinya Sebagai Adsorben Ion Logam Pb(II). *Skripsi*, UIN Sunan Kalijaga.
- Nikolelis, D. P., Raftopoulou, G., Psaroudakis, N., & Nikoleli, G. P. (2009). Development of an Electrochemical Chemosensor for the Rapid Detection of Zinc Based on Air Stable Lipid Films With Incorporated Calixarene Phosphoryl Receptor. *International Journal of Environmental and Analytical Chemistry*, 89(3), 211-222.
- Oxtoby, D. (1990). *Prinsip-prinsip Kimia Modern*. Erlangga. Jakarta. Hal. 285-290.
- Parker, S.P. (1993). *Encyclopedia of Chemistry. Second Edition*. New York: Mc GrawHill Book Company.
- Particle Analytical. (2021). *BET Theory*. Diakses pada 11 November 2021 dari <https://particle.dk/single-analysis/bet-theory-2/>
- Pod, S. N., Mustafina, A. R., Koppehele, A. H., Grüner, M., Habicher, W. D., Buzykin, B. I., & Konovalov, A. I. (2004). Synthesis of Per-O-(Carboxymethyl) Calix[4]pyrogallols and Their Complexation With Some Alkaline Metal and Lanthanide Ions. *Russian Chemical Bulletin*, 53(6), 1181-1188.
- Podyachev, S. N., Syakaev, V. V., Sudakova, S. N., Shagidullin, R. R., Osyanina, D. V., Avvakumova, L. V., ... & Konovalov, A. I. (2007). Synthesis of New Calix[4]arenes Functionalized by Acetylhydrazide Groups. *Journal of Inclusion Phenomena and Macrocyclic Chemistry*, 58(1-2), 55-61.
- Prasetyoko, D., Fansuri, H., Ni'mah, Y. L., & Fadlan, A. (2016). *Karakterisasi Struktur Padatan*. Yogyakarta : Deepublish.
- Priyadarshanee, M., & Das, S. (2021). Biosorption and Removal of Toxic Heavy Metals by Metal Tolerating Bacteria for Bioremediation of Metal Contamination: A Comprehensive Review. *Journal of Environmental Chemical Engineering*, 9(1), 104686.
- Puriyandari, D., & Laksono, P. J. (2019). Pengaruh Ion Cr (VI) Pada Variasi pH Terhadap Serapan Ion Cu (II) oleh Adsorben Kulit Kacang Tanah dengan Spektrofotometri Serapan Atom. *Orbital: Jurnal Pendidikan Kimia*, 3(1), 15-29.

- Purwaningsih, D. (2009). Adsorpsi Multi Logam Ag (I), Pb (II), Cr (III), Cu (II) Dan Ni (II) pada Hibrida Etilendiamino-Silika dari Abu Sekam Padi. *Jurnal Penelitian Saintek*, 14(1), 59-76.
- Rastuti, U., Siswanta, D., Pambudi, W., Nurohmah, B. A., & Yamin, B. M. (2018). Synthesis, Characterization and Adsorption Study of C-4-Phenacyloxy-Phenylcalix[4]resorcinarene for Pb (II), Cd (II) and Cr (III) Ions. *Sains Malaysiana*, 47(6), 1167-1179.
- Ren, H., Jiang, J., Wu, D., Gao, Z., Sun, Y., & Luo, C. (2016). Selective Adsorption of Pb (II) and Cr (VI) by Surfactant-modified and Unmodified Natural Zeolites: A Comparative Study on Kinetics, Equilibrium, and Mechanism. *Water, Air, & Soil Pollution*, 227(4), 1-11.
- Ruthven, D. M., (1984). *Principle of adsorption and Adsorption Process*. New York : JohnWiley dan Sons. 124-141.
- Sahara, E., Gayatri, P. S., & Suarya, P. (2018). Adsorpsi Zat Warna Rhodamin-B dalam Larutan oleh Arang Aktif Batang Tanaman Gumitir Teraktivasi Asam Fosfat. *Cakra Kim. Indonesian E-Journal Appl. Chem*, 6(1), 37-45.
- Saputra, (2021) Sintesis C-Fenilkaliks[4]Resorsinarena Serta Aplikasinya Sebagai Adsorben Ion Cr(VI). *Skripsi*. Purwokerto : Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Jenderal Soedirman.
- Sardjono, R. E., Dwiyanti, G. E. B. I., Aisyah, S. I. T. I., & Khoerunnisa, F. I. T. R. I. (2009). The Synthesis of Calix [4] Resorcinarene From Cassia Oil and Its Application for Solid Phase Extraction of Heavy Metal Hg (II) and Pb (II). *In Prosiding Seminar Kimia Bersama UKM-ITB VIII*, 9, 11.
- Sastrohamidjojo, Hardjono. (1991). *Kromatografi Edisi kedua*. Yogyakarta : Liberty.
- Settle, F. (1997). *Handbook of Instrumental Techniques for Analytical Chemistry*. New Jersey: Prentice-Hall Inc.
- Siregar, K. N. A. (2019). Penyisihan Logam Berat Pb (II) dan Cd (II) dengan Adsorben yang Dibuat dari Serbuk Kayu yang Diaktivasi dengan H_3PO_4 . *Skripsi* : Universitas Sumatera Utara.
- Siswanta, D., Jumina, J., Anggraini, M., Mardjan, M. I. D., Mulyono, P., & Ohto, K. (2016). Adsorption Study of Pb (II) on Calix [4] resorcinarene-Chitosan Hybrid. *International Journal of Applied Chemistry*, 12(1), 11-22.
- Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2013). *Fundamental of Analytical Chemistry (9 ed.)*. USA: Brooks/Cole Cengage Learning.
- SNI. (2009). *SNI Air dan Air Limbah-Bagian 8 : Cara Uji Timbal (Pb) Secara Spektrofotometri Serapan Atom (SSA)-Nyala*. BSNI.

- Sudarmaji, J.Mukono, & Corie I.P, (2006), Toksikologi Logam Berat B3 dan Dampaknya Terhadap Kesehatan. *Jurnal Kesehatan Lingkungan*, Vol. 2, No. 2, akses 8 November 2018.
- Sudjadi M.S., (1985). *Penentuan Struktur Senyawa Organik*. Yogyakarta : Ghalia Indonesia.
- Sugiharto, E. (1992). *Atomic Absorbtion Spectrometry*. Yogyakarta : UGM.
- Supratman, U. (2010). *Elusidasi Struktur Senyawa Organik (Metode Spektroskopi untuk Penentuan Struktur Senyawa Organik)*. Bandung: Widya Pajajaran.
- Syauqiah, I., Amalia, M., & 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.
- Tangio, J. S. (2013). Adsorpsi Logam Timbal (Pb) Dengan Menggunakan Biomassa Enceng Gondok (*Eichhornia crassipes*). *Jurnal Entropi*, 8(01).
- Thomas, H. M., Kumari, H., Maddalena, J., Mayhan, C. M., Ellis, L. T., Adams, J. E., & Deakyne, C. A. (2018). Conformational Preference and Dynamics of Pyrogallol [4] arene: Stability, Interconversion, and Solvent Influence. *Supramolecular Chemistry*, 30(5-6), 520-532.
- Tunstad, L. M., Tucker, J. A., Dalcanale, E., Weiser, J., Bryant, J. A., Sherman, J. C., ... & Cram, D. J. (1989). Host-guest Complexation. 48. Octol Building Blocks for Cavitands and Carcerands. *The Journal of Organic Chemistry*, 54(6), 1305-1312.
- Widayatno, T. (2017). Adsorpsi Logam Berat (Pb) dari Limbah Cair Dengan Adsorben Arang Bambu Aktif. *Jurnal Teknologi Bahan Alam*, 1(1), 17-23.
- Yang, X., Yang, S., Yang, S., Hu, J., Tan, X., & Wang, X. (2011). Effect of pH, Ionic Strength and Temperature on Sorption of Pb (II) on NKF-6 Zeolite Studied by Batch Technique. *Chemical Engineering Journal*, 168(1), 86-93.
- Yuna, R., & Mardina, V. (2019). Pengujian Karakteristik Kimia pada Limbah Cair Kelapa Sawit di Pabrik X. *Biologica Samudra*, 1(1), 1-8.