



## DAFTAR PUSTAKA

- Abdullah, N.H., Kaymar, S.M., Poora, E., Mohammad, C., Ezzat, C., and Luqman, 2017, Fecle and Green Prepatation of Magnetite/Zeolit Nanocomposites for Energy Application in a Single Step Procedure, *J. Alloys. Compd.*, 17, 1-23.
- Adawiah, S.R., Sutarno, dan Suyanta, 2020, Studi Adsorpsi-Desorpsi Anion Fosfat pada Bentonit Termodifikasi CTAB, *Indo. J. Chem. Res.*, 8(2), 125–36.
- Adisu, N., Balakrishnan, S., and Tibebe, H., 2022, Synthesis and Characterization of Fe<sub>3</sub>O<sub>4</sub>-Bentonite Nanocomposite Adsorbent for Cr(VI) Removal from Water Solution, *Int. J. Chem. Eng.*, 1, 2-18.
- Agnestisia, R., 2017, Sintesis dan Karakterisasi Magnetit (Fe<sub>3</sub>O<sub>4</sub>) serta Aplikasinya sebagai Adsorben Methylene Blue, *Al Kimiya*, 11, 61–70.
- Apriliani, A., 2010, Pemanfaatan Arang Ampas Tebu sebagai Adsorben Ion Logam Cd, Cr, Cu, dan Pb dalam Air Limbah, *Skripsi*, Universitas Islam Negeri Syarif Hidayatullah, Jakarta.
- Arif, M.D. dan Anwar, M., 2020, Pengaruh Konsentrasi Awal Larutan Terhadap Penyerapan Ion Logam Cr<sup>6+</sup> Menggunakan Biomassa Alga Hijau *Mougeotia Sp* yang Diimobilisasi Dengan Natrium Silika, *Periodic*, 9, 50–54.
- Alekseeva, O.V., Rodionova, A.N., Bagrovskaya, A.N., and Agafonov, A.V., 2016, Synthesis, Structure, and Properties of a Bentonite–Magnetite Composite, *Prot. Met. Phy. Chem. Surf.*, 52(5), 819–24.
- Alekseeva, O.V., Rodionova, A.N., Noskov, A.V., and Agafonov. A.V., 2019, Bentonite/Magnetite Composite for Removal of Nitrofurazone, *Clays and Clay Minerals*, 67(6), 471–80.
- Bagbi, Y, Sarswat, A., Mohanb, D., Pandeyc, A., Pratima, and Solanki, 2016, Lead (Pb<sup>2+</sup>) Adsorption by Monodispersed Magnetite Nanoparticles: Surface Analysis and Effects of Solution Chemistry, *J. Environ. Chem. Eng.*, 4, 4237–4247.
- Bai, B., Bai, F., Li, X., Nie, Q., Jia, X., and Wu, H., 2022, The Remediation Efficiency of Heavy Metal Pollutants in Water by Industrial Red Mud Particle Waste, *Environ Technol and Innov.*, 28, 102944.
- Banu, H.T., Karthikeyan, P., and Meenakshi, S., 2019, Zr<sup>4+</sup> Ions Embedded Chitosan-Soya Bean Husk Activated Biochar Composite Beads for The Recovery of Nitrate and Phosphate Ions from Aqueous Solution, *Int. J. Biol. Macromol.*, 130, 573–583.
- Barakan, S., and Aghazadeh, V., 2019, Separation and Characterisation of Montmorillonite from a Low-Grade Natural Bentonite: Using a Non-Destructive Method, *Micro and Nano Letters*, 14(6), 688–93.



- Barros, J.L.M., Maedo, G.R., Duarte, M.M.L., Silva, E.P., and Lobato, 2003, Biosorption Cadmium Using The Fungus Aspergillus niger, *Braz. J. Chem.*, 20, 1–17.
- Belachew, N., and Bekele., G., 2020, Synergy of Magnetite Intercalated Bentonite for Enhanced Adsorption of Congo Red Dye, *Silicon*, 12(3), 603–12.
- Benli, B., 2013, Effect of Borax Addition on The Structural Modification of Bentonite in Biodegradable Alginate-Based Biocomposites, *J. Appl. Polym. Sci.*, 128(6), 4172–80.
- Castellan, G.W., 1985, *Physical Chemistry*, 2<sup>th</sup> Ed., Addisoan Wesley Publishing Company, Massachusetts.
- Chang, Y.S., Au, P.I., Mubarak, N.M., Khalid, M., Jagadish, P., Walvekar, R., and Abdullah, E.C., 2020, Adsorption of Cu(II) and Ni(II) Ions from Wastewater onto Bentonite and Bentonite/GO Composite, *Environ. Sci. Pollut. Res.*, 27(26), 33270–33296.
- Chittoo, B.S., and Sutherland, C., 2019, Adsorption Using Lime-Iron Sludge-Encapsulated Calcium Alginate Beads for Phosphate Recovery with ANN- and RMS-Optimized Encapsulation, *J. Enviro. Eng.*, 145(5), 1-18.
- Chu, K.H., 2021, Revisiting the Temkin Isoterm: Dimensional Inconsistency and Approximate Forms, *Ind. Eng. Chem. Res.*, 60, 13140-13147.
- Cornell, R.M. and Schwertmann, 2003, *The Iron Oxide: Structure, Properties, Reaction, Occurrences, and Use*, 2<sup>nd</sup> Ed., WILEY-VCH, Weinheim.
- Darmadinata, M., Jumaeri, dan Sulistyaningsih, T., 2019, Pemanfaatan Bentonit Teraktivasi Asam Sulfate sebagai Adsorben Anion Fosfat dalam Air, *Indo. J. Chem. Sci.*, 8(1), 2-8.
- Das, T.K., Scott, Q., and Bezbaruah. A.N., 2021, Montmorillonite-Iron Crosslinked Alginate Beads for Aqueous Phosphate Removal, *Chemosphere*, 281, 2-9.
- Ding, F., Gao, M., Shen, T., Zeng, H., and Xiang, Y., 2018, Comparative Study of Organovermiculite, Organo-Montmorillonite and Organo-Silica Nanosheets Functionalized by An Ether-Spacer-Containing Gemini Surfactant: Congo Red Adsorption And Wettability, *Chem. Eng. J.*, 349, 388–396.
- Edathil, A.A., Alhseinat, E., and Banat, F., 2019, Removal of Heat Stable Salts from Industrial Lean Methyldiethanolamine Using Magnetic Alginate/Iron Oxide Hydrogel Composite, *Int. J. Greenh. Gas Control*, 83, 117–27.
- Elsayed, A.E., Osman, D.I., Attia, S.K., Ahmed, H.M., Shoukry, E.M., Mahmoud, G.A., Mostafa, Y.M., and Taman, A.R., 2020, Synthesis of Super Magnetite(Fe<sub>3</sub>O<sub>4</sub>)/ Bentonite Nanocomposite for Efficient Remediation for Industrial Wastewater Effluents, *Egypt. J. Chem.*, 63(12), 5011–26.



- El-Shamy, O. A. A., El-Azabawy, R.E., and El-Azabawy, O.E., 2019, Synthesis and Characterization of Magnetite-Alginate Nanoparticles for Enhancement of Nickel and Cobalt Ion Adsorption from Wastewater, *J. Nanomater.*, 1, 2-8.
- Fabryanty, R., Valencia, C., Soetaredjo, E.F., Putro, J.N., Santoso, S.P., Kurniawan, A., Ju, Y.H., and Ismadji, S., 2017, Removal of Crystal Violet Dye by Adsorption Using Bentonite-Alginate Composite, *J. Environ. Chem. Eng.*, 5(6), 5677-87.
- Fadillah, G., Yudha, S.P., Sagadevan, S., Fatimah, I., and Muraza, O., 2020, Magnetit Iron Oxide/Clay Nanocomposite for Adsorption and Catalytic Oxidation In Water Treatment Application, *Open Chemistry*, 18, 1148-1166.
- Feng, Q., Chen, M., Wu, P., Zhang, X., Wang, S., Yu, Z., and Wang, B., 2022, Simultaneous Reclaiming Phosphate and Ammonium from Aqueous Solutions by Calcium Alginate-Biochar Composite: Sorption Performance and Governing Mechanisms, *J. Chem. Eng.*, 429, 1-15.
- Gomri, F., Finqueneisel, G., Zimmy, T., Korili, S., Gil, A., and Boutahala, M., 2018, Adsorption of Rhodamine 6G and Humic Acids on Composite Bentonite-Alginate in Single And Binary Systems, *Applied Water Science*, 8(6), 2-10.
- Gultom, E.M. dan Lubis, M.T., 2014, Aplikasi Karbon Aktif dari Cangkang Kelapa Sawit dengan Aktivator H<sub>3</sub>PO<sub>4</sub> untuk Penyerapan Logam Berat Cd dan Pb, *J. Teknik Kimia USU*, 3, 5-10.
- Han, L., Wang, Y., Zhao, W., Zhang, H., Gou, F., Wang, T., and Wang, W., 2022, Cost-Effective and Eco-Friendly Superadsorbent Derived from Natural Calcium-Rich Clay for Ultra-Efficient Phosphate Removal in Diverse Waters, *Sep. Purif. Technol.*, 297, 2-11.
- Han, X., Wang, W., and Ma, X., 2011, Adsorption Characteristics of Methylene Blue onto Low Cost Biomass Material Lotus Leaf, *J. Chem. Eng.*, 171, 1-8.
- Hermanto, D., Mudasir, Siswanta, D., and Kuswandi, B., 2019, Synthesis of Alginate-Chitosan Polyelectrolyte Complex (PEC) Membrane and Its Physical-Mechanical Properties, *J. Kim. Sains. Apl.*, 22(1), 11-16.
- Hou, L., Liang, Q., dan Wang, F., 2020, Mechanisms that Control The Adsorption-Desorption Behavior of Phosphate on Magnetite Nanoparticles: The Role of Particle Size and Surface Chemistry Characteristics, *RSC Advances*, 10(4), 2378-88.
- Ho, Y.S., and McKay, G., 1999, Pseudo-Second Order Model for Sorption Processes, *Process Biochemistry*, 34, 451-465.



- Hu, Q., and Zhang, Z., 2019, Application of Dubinin-Radushkevich Isotherm Model at the Solid/Solution Interface: A Theoretical Analysis, *J. Mol. Liq.*, 277, 646-648.
- Ismadji, S., Soetaredjo, F.E., Santoso, S.P., Putro, J.N., Yuliana, M., Irawaty, W., Hartono, S.B., dan Lunardi, V.B., 2021, *Adsorpsi pada Fase Cair: Kesetimbangan, Kinetika dan Termodinamika*, Universitas Katolik Widya Mandala Surabaya, Surabaya.
- Kecili, R., and Hussain, C.M., 2018, Mechanism of Adsorption on Nanomaterials, *Nanomater.Chromatogr.*, 1, 89-115.
- Khaleghi, H., Jaafarzadeh, N., Esmaeili, H., and Ramavandi, B., 2023, Alginate@Fe3O4@Bentonite Nanocomposite for Formaldehyde Removal from Synthetic and Real Effluent: Optimization by Central Composite Design, *Environ. Sci. Poll. Res.*, 30(11), 29566–829580.
- Kumar, R., Sakthivel, R., Behura, R., Mishra, K., and Das, 2015, Synthesis of Magnetite Nanoparticles From Mineral Waste, *J. Alloys Compd.*, 645, 398–404.
- Kumar, I.A., and Viswanathan, N., 2020, Fabrication of Zirconium (IV) Cross-linked Alginate/Kaolin Hybrid Beads for Nitrate and Phosphate Retention, *Arab. J. Chem.*, 13, 4111-4125.
- Kumar, I.K., El-Serehy, H.A., Al-Misned, F.A., and Viswanathan, N., 2021, Complex Fabrication of Zr<sup>4+</sup>, La<sup>3+</sup>, and Ce<sup>3+</sup> Coordinated Alginate-Assisted Bentonite-Based Hybrid Beads for Nitrate Removal, *J. Chem. Eng.*, 66, 979-989.
- Langmuir, I., 1918, The Adsorption of Gases on Plane Surfaces of Glass, Mica, and Platinum, *J. Am. Chem. Soc.*, 40(9), 1361-1403.
- Lin, J., Jiang, B., and Zhan, Y., 2018, Effect of Pre-Treatment Of Bentonite with Sodium and Calcium Ions on Phosphate Adsorption onto Zirconium-Modified Bentonite, *J. Environ. Manag.*, 217, 183–195.
- Lestari, S., Yuningsih, L.M., dan Muhamram, S., 2022, Hidrogel Superabsorben Berbasis Natrium Alginat-Bentonit sebagai Pelapis Pupuk Lepas Lambat, *J.Ris.Kim.*, 13(1), 58-67.
- Masruhin, Rasyid, R., dan Yani, S., 2018, Penyerapan Logam Berat Timbal (Pb) dengan Menggunakan Lignin Hasil Isolasi Jerami Padi, *J. of. Chem. Process. Eng.*, 3(1), 11-20.
- Mdlalose, T., Baloguna, M., Setshedi, K., Chimuka, L., and Chetty, A., 2019, Adsorption of Phosphates Using Transition Metals-Modified Bentonite Clay, *Sep. Sci. Technol.*, 54(15), 2397–2408.



- Merayo, N., Balea, A., Tejera, J., Garrido-Escudero, A., Negro, C., and Blanco A, 2020, Modelling the Mineralization of Formaldehyde by Treatment with Nitric Acid, *Water*, 12(6),1567.
- Mohammadi, R., Hezarjaribi, M., Ramasamy, D.L., Sillanpaa, M., and Pihlajamaki, A., 2021, Application of a Novel Biochar Adsorbent and Membrane to The Selective Separation of Phosphate from Phosphate-Rich Wastewaters, *Chem. Eng. J.*, 407, 126494.
- Niculescu, A.G., Chirov, C., and Grumezescu, A.M., 2022, Magnetite Nanoparticles: Synthesis Methods – a Comparative Review, *Methods*, 199, 16–27.
- Niculescu, A.G., and Grumezescu, A.M., 2022, Applications of Chitosan-Alginate-Based Nanoparticles- An Up-to-Date Review, *Nanomaterials*, 12(2), 2-23.
- Nkurikiyimfura, I., Wang, Y., Safari, B., and Nshingabigwi, E., 2020, Temperature-Dependent Magnetic Properties of Magnetite Nanoparticles Synthesized Via Coprecipitation Method, *J. Alloys. Comp.*,846, 2-10.
- Noll, K.E., Gournaris, V., and Hou, W.S., 1992, *Adsorption Technology for Air and Water Polution Control*, Lewish Publisher, Michigan.
- Okube, M., Yasue, T., and Sasaki, S., 2012, Residual-Density Mapping and Site-Selective Determination of Anomalous Scattering Factors to Examine The Origin of The Fe K Pre-Edge Peak of Magnetite, *J. Synchrotron Rad.*, 19, 759–767.
- Pawar, R., Gupta, P., Lalhmunsaima, Bajaj, C.H., and Lee, S.M., 2016, Al-Intercalated Acid Activated Bentonite Beads for The Removal of Aqueous Phosphate, *Science of Total Environment*, 572, 1222-1230.
- Peraturan Menteri Lingkungan Hidup Republik Indonesia Nomor 5 Tahun 2014 Tentang Baku Mutu Air Limbah.
- Qussalah, A., and Boukerroul, 2020, Alginate-Bentonite Beads for Efficient Adsorption of Methylene Blue Dye, *Euro-Medite. J. Environ. Integr.*, 5(2), 2-10.
- Rapa, M., Turcanu, A.A., Matei, E., Predescu, A.M., Pantilimon, M.C., Coman, G., and Predescu, C., 2021, Adsorption of Copper (II) from Aqueous Solutions with Alginate/Clay Hybrid Materials, *Materials* 14(23), 2-16.
- Rathi, B.S., and Kumar, P.S., 2021, Application of Adsorption Process for Effective Removal of Emerging Contaminants from Water and Wastewater, *Environ. Poll.*, 280, 2-19.
- Ren, G., Yang, L., Zhang, Z., Zhong, B., Yang, and Wang, X., 2017, A New Green Synthesis of Porous Magnetite Nanoparticles from Waste Ferrous Sulfate by Solid-Phase Reduction Reaction, *J. Alloys Compd.*, 710, 875–879.



- Reyra, A.S., Daud, S., dan Yenti, S.R., 2017, Pengaruh Massa dan Ukuran Partikel Adsorben Daun Nanas Terhadap Efisiensi Penyisihan Fe Pada Air Gambut, *JOM F. Teknik*, 4, 1–9.
- Revellame, E. D., Fortela, D.L., Sharp, W., Hernandez, R., and Zappi, M.E., 2020, Adsorption Kinetic Modeling Using Pseudo-First Order and Pseudosecond Order Rate Laws: a Review, *Clean Eng Technol*, 1, 100032.
- Rivani, D.A., Retnosari, I., Kusumandari, dan Saraswati, T.E., 2019, Influence of TiO<sub>2</sub> Addition on the Magnetic Properties of Carbon-Based Iron Oxide Nanocomposites Synthesized using Submerged Arc-Discharge, *Mat. Scie. Eng.*, 509, 1-6.
- Taglieri, P., Milham, P., Holford, P., and Morrison, R.J., 2020, A Methodology to Estimate Net Proton: Phosphorus Co-Adsorption Ratios for Acidic Soils, *Adv. Chem. Res.*, 2(2), 2-16.
- Trisnawati, A.R., dan Cahyaningrum, S.E., 2014, Enkapsulasi Pirazinamid Menggunakan Alginat-Kitosan dengan Variasi Konsentrasi Penambahan Surfaktan Tween 80, *J. Chem.*, 3(3), 27-33.
- Tseng, R.L., Wu, F.C., and Juang, R.S., 2010, Characteristics and Applications of The Lagergren's First-Order Equation for Adsorption Kinetics, *J. Taiwan Inst. Chem. Eng.*, 41, 661-669.
- Saito, T., 1996, *Kimia Anorganik*, Iwanami Shoten Publishers, Tokyo.
- Shu, B., Wu, S., Dong, L., Wang, Q., and Liu, Q., 2018, Microfluidic Synthesis of Ca-Alginate Microcapsules for Self-Healing of Bituminous Binder, *Materials*, 11, 2-15.
- Shaumbwa, V.R., Liu, D., Archer, B., Li, J., and Su, F., 2021, Preparation and ApplicatioFn of Magnetic Chitosan in Environmental Remediation and Other Fields: A review, *J. Appl. Polym. Sci.*, 138.
- Sukma, N.S., Arryanto, Y., and Sutarno, 2016, Characterization nnd Study of Iron(III)-Released from Alginate/Zeolite/Fe Composite, *Jurnal Ilmu-Ilmu MIPA*, 1, 80-93.
- Wang, B., Wan, Y., Zheng, Y., Lee, X., Liu, T., Yu, Z., Huang, J., Sik Ok, Y., Chen, J., and Gao, B., 2019, Alginate-Based Composites for Environmental Applications: a Critical Review, *Critical Reviews in Environmental Science and Technology*, 49(4), 318–56.
- Wang, B., Zhang, W., Li, Lu., Guo, W., Xing, J., Wang, H., Hu, X., Lyu, W., Chen, R., Song, J., and Chen, L., 2020, Novel Talc Encapsulated Lanthanum Alginate Hydrogel for Efficient Phosphate Adsorption and Fixation, *Chemosphere*, 256, 2-10.
- Wang, X., Zhao, J., Yu, D., Chen, G., Du, S., Zhen, J., and Yuan, M., 2019, Stable Nitrite Accumulation and Phosphorous Removal from Nitrate and



Municipal Wastewaters in a Combined Process of Endogenous Partial Denitrification and Denitrifying Phosphorus Removal (EPDPR), *Chem. Eng. J.*, 355, 560–571.

Wardani, D.A.P., Damsyik, A., Karelius, Suyanta, dan Siswanta, D., 2021, Investigasi Sifat Magnet Dan Luas Permukaan Bentonit Termagnetisasi Sebagai Adsorben Cepat Pisah, *Jurnal Sains dan Terapan Kimia*, 15(2), 108-118.

Wardiyati, S., Fisli, A., dan Ridwan, 2011, Penyerapan Logam Ni dalam Larutan oleh Nanokomposit Fe<sub>3</sub>O<sub>4</sub>-Karbon Aktif, *Indones. J. Mater. Sci.*, 12, 224–228.

Wijayanti, I.E., dan Kurniawati, E.A., 2019, Studi Kinetika Adsorpsi Isoterm Persamaan Langmuir dan Freundlich pada Abu Gosok sebagai Adsorben, *Jurnal Kimia dan Pendidikan*, 4(2), 175-184.

Wroblewski, C., Volford, T., Martos, B., Samoluk, J., and Martos, P., 2020, High Yield Synthesis and Application of Magnetite Nanoparticles (Fe<sub>3</sub>O<sub>4</sub>), *Magnetochemistry*, 6(2), 1–14.

Wulandari, I.O., Santjojo, D.J.D.H., Shobirin, R.A., and Sabarudin, A., 2017, Characteristics and Magnetic Properties of Chitosan-Coated Fe<sub>3</sub>O<sub>4</sub> Nanoparticles Prepared by Ex-Situ Co-Precipitation Method, *Rasayan J. Chem.*, 10, 1348–1358.

Xi, H., Jiang, H., Zhao, D., Zhang, A.H., Fan, B., Yang, Y., and Zhang, J., 2021, Highly Selective Adsorption of Phosphate from High-Salinity Water Environment Using Mgo-Loaded and Sodium Alginate-Immobilized Bentonite Beads, *Journal of Cleaner Production*, 313, 1-13.

Xu, X., Wang, B., Tang, H., Jin, Z., Mao, Y., and Huang, T., 2020, Removal of Phosphate from Wastewater by Modified Bentonite Entrapped in Ca-Alginate Beads, *J. Environ. Management*, 260, 1-8.

Yaghoobi-Rahni, S., Rezaei, B., and Mirghaffari, N., 2017, Bentonite Surface Modification and Characterization for High Selective Phosphate Adsorption from Aqueous Media and its Application for Wastewater Treatments, *J. Water. Reuse. Desalin.*, 7, 175-186.

Yang, Q., Wang, X., Luo, W., Sun, J., Xu, Q., Chen, F., Zhao, J., Wang, S., Yao, F., Wang, D., Li, X., and Zeng, G., 2018, Effectiveness and Mechanisms of Phosphate Adsorption on Iron-Modified Biochars Derived from Waste Activated Sludge, *Bioresource Technology*, 247, 537–44.

Yan, K., Guo, Y., Wu, X., dan Cheng, F., Effect of Organic Matter on the Rietveld Quantitative Analysis of Crystalline Minerals in Coal Gangue, *Powder Diffraction*, 31(3), 185-191.

Yao, Y., Xu, F., Chen, M., Xu, Z., and Zhu, Z., 2010, Adsorption Behavior of Methylene Blue on Carbon Nanotubes, *Bio. Tech.*, 101, 3040–3046.



Zahid, M., Saqib, N., Nadia, J., Asma, S., and Adnan, A., 2015, Adsorption Studies of Phosphate Ions on Alginate-Calcium Carbonate Composite Beads, *Af. J. Environ. Sci. Technol.*, 9(3), 274–81.

Zang, H., Shi, Y., Xu, X., Zhang, M., and Ma, L., 2020, Structure Regulation of Bentonite-Alginate Nanocomposites for Controlled Release of Imidacloprid, *ACS Omega*, 5, 10068-10076.