

DAFTAR PUSTAKA

- Abukhadra, M.R., El-Sherbeeney, A.M., El-Meligy, M.A., and Luqman, M., 2021, Insight into carbohydrate polymers (chitosan and 2-hydroxyethyl methacrylate/methyl methacrylate) intercalated bentonite-based nanocomposites as multifunctional and environmental adsorbents for z-methyl parathion pesticide, *Int. J. Biol. Macromol.*, 167, 335–344.
- Agnestisia, R., 2017, Sintesis dan Karakterisasi Magnetit (Fe_3O_4) serta Aplikasinya sebagai Adsorben Methylene Blue, *Al Kimiya*, 11, 61–70.
- Ahamed, H.N., Y, I., Navabshan, I., S, M.Z., TS, S., Jaleel, I., and LH, T.A., 2024, Investigating the toxicity of malachite green and copper sulfate in brine shrimp: In-vivo and computational study, *Toxicol. Rep.*, 13, 1-11.
- Ahmad, R., and Mirza, A., 2017, Green synthesis of Xanthan gum/Methionine-bentonite nanocomposite for sequestering toxic anionic dye, *Surf. Interfaces*, 8, 65–72.
- Ahn, T., Kim, J.H., Yang, H., Lee, J.W., and Kim, J.D., 2012, Formation Pathways of Magnetite Nanoparticles by Coprecipitation Method, *J. Phys. Chem.*, 116(10), 6069-6076.
- Ain, Q.U., Zhang, H., Yaseen, M., Rasheed, U., Liu, K., Subhan, S., and Tong, Z., 2020, Facile Fabrication of Hydroxyapatite-Magnetite-Bentonite Composite for Efficient Adsorption of Pb(II), Cd(II), and Crystal Violet from Aqueous Solution, *J. Clean. Prod.*, 247, 1–15.
- 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.
- Al-husseiny, R. A., and Ebrahim, S. E., 2022, Effective Removal of Methylene Blue from Wastewater Using Magnetite/Geopolymer Composite: Synthesis, Characterization and Column Adsorption Study, *Inorg. Chem. Commun.*, 139, 1-11.

- Aljeboree, A.M., Alshirifi, A.N., and Alkaim, A.F., 2017, Kinetics and Equilibrium Study for the Adsorption of Textile Dyes on Coconut Shell Activated Carbon, *Arabian J. Chem.*, 10, S3381-S3393.
- Andersen, W.C., Turnipseed, S.B., and Roybal, J.E. n.d., 2006, Quantitative and confirmatory analyses of malachite green and leucomalachite green residues in fish and shrimp, *J. Agric. Food Chem.*, 54(13), 4517-4523.
- Anggriani, U.M., Hasan, A., dan Purnamasari, I., 2021, Kinetika Adsorpsi Karbon Aktif Dalam Penurunan Konsentrasi Logam Tembaga (Cu) Dan Timbal (Pb), *Jurnal Kinetika*, 12(02), 29–37.
- Atkins, P., and De Paula, J., 2010, *Physical Chemistry*, 9thEd., W. H. Freeman and Company, New York.
- Belhouchat, N. H., Martín-Lara, M. Á., Zaghoulane-Boudiaf, H., Blázquez García, G., Hamadi, A., and Viseras Iborra, C., 2022, Efficient removal of methylene blue using Algerian purified bentonite/sodium alginate beads in batch, recirculating, and continuous adsorption processes, *Int. J. Environ. Anal. Chem.*, 1-19.
- Belhouchat, N., Zaghoulane-Boudiaf, H., and Viseras, C., 2017, Removal of anionic and cationic dyes from aqueous solution with activated organo-bentonite/sodium alginate encapsulated beads, *Appl. Clay Sci.*, 135, 9–15.
- Belkhodja, A., Choukhou-Braham, E., Benkhaled, A., Guendouz, S., and Attar, T. 2024, Study of the adsorption of a textile dye by alginate-bentonite beads: CCD-RSM design conception, *J. Macromol. Sci. Part B Phys.*, 1-23.
- Bonelli, B., Freyria, F.S., Rossetti, I., and Sethi, R., 2020, *Nanomaterials for the Detection and Removal of Wastewater Pollutants*, Elsevier Science.
- Brown, T.L., H. Eugene LeMay, J., Bursten, B.E., Murphy, C.J., Woodward, P.M., W.Stoltzfus, M., and Lufaso, M.W., 2009, *Chemistry The Central Of Science*, 14th Ed., Pearson, London.
- Castellan, G.W., 1985, *Physical Chemistry*, 2th Ed., Addison Wesley Publishing Company, Massachusetts.
- Chokri, M., Azougagh, O., El Bojaddayni, I., Jalafi, I., EL Ouardi, Y., Jilal, I., Ahari, M., Salhi, A., El Idrissi, A., Bendahhou, A., Abou-Salama, M., and

- El Barkany, S., 2025, Progress in bentonite clay modification and enhancing properties to industrial applications: A review, *Mater. Chem. Phys.*, 337, 2-15.
- Cotton, F.A., and Wilkinson G.F.R.S., 1976, *Advanced Inorganic Chemistry*, 3rd Ed, University of London, England.
- Cui, Q., and Chen, B., 2023, Review of polymer-amended bentonite: Categories, mechanism, modification processes and application in barriers for isolating contaminants. *Appl. Clay Sci.*, 235, 1-10.
- Dabrowski, A., 2001, Adsorption – from theory to practice, *Adv. Colloid Interface Sci.*, 93, 135-224.
- Daoush, W.M., 2017, Co-Precipitation and Magnetic Properties of Magnetite Nanoparticles for Potential Biomedical Applications, *J. Nanomed. Res.*, 5(3).
- Das, L., Saha, N., Ganguli, A., Das, P., Bhowal, A., and Bhattacharjee, C., 2021, Calcium alginate–bentonite/activated biochar composite beads for removal of dye and biodegradation of dye-loaded composite after use: Synthesis, removal, mathematical modeling and biodegradation kinetics, *Environ. Technol. Innov.*, 24, 1-19.
- Ding, F., Li, X.N., Diao, J.X., Sun, Y., Zhang, L., Ma, L., Yang, X.L., Zhang, L., and Sun, Y., 2012, Potential toxicity and affinity of triphenylmethane dye malachite green to lysozyme, *Ecotoxicol. Environ. Saf.*, 78, 41–49.
- Dong, Y., Abbasi, A., Mohammadnejad, S., Nasrollahzadeh, M., Sheibani, R., and Otadi, M., 2024, Recent progresses in bentonite/lignin or polysaccharide composites for sustainable water treatment, *Int. J. Biol. Macromol.*, 278, 2-25.
- Fabryanty, R., Valencia, C., Soetaredjo, F.E., 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, 5677–5687.
- Fadhilah, A.H., Ngatijo, dan Gusti D.R., 2019, Sintesis dan Karakterisasi Magnetit Terlapis Dimerkaptosilika, *Chempublish Journal*, 4(2), 81-88.

- 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.
- Filiz, C. B., Akar, Y., and Figen, K. A., 2025, The new identity of alginate composite with bentonite as a sustainable catalytic natural-based material: Methylene blue decolorization in continuous flow-packed-bed reactor, *J. Polym. Environ.*, 33, 1864-1880.
- Forstner, U., and Wittman, G.T., 1983, *Metal Pollution in the Aquatic Environment*, 2nd Edition, Springer, New York.
- Gong, X.L., Lu, H.Q., Li, K., and Li, W., 2022, Effective adsorption of crystal violet dye on sugarcane bagasse–bentonite/sodium alginate composite aerogel: Characterisation, experiments, and advanced modelling, *Sep. Purif. Technol.*, 286, 1-12.
- Hassan, A.F., El-Naggar, G.A., Braish, A.G., Abd El-Latif, M.M., Shaltout, W.A., and Elsayed, M.S., 2023, Fabrication of titania/calcium alginate nanocomposite matrix for efficient adsorption and photocatalytic degradation of malachite green, *Int. J. Biol. Macromol.*, 249, 1-16.
- 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.
- Ilyas, M., Ahmad, W., and Khan, H., 2022, Utilization of composite adsorbents for polycyclic aromatic hydrocarbons adsorption from vehicle wash wastewater and aqueous solutions, *Desalination Water Treat.*, 256, 194–216.
- Jannah, R., and Onggo, D., 2019, Synthesis of Fe₃O₄ Nanoparticles for Colour Removal of Printing Ink Solution, *J. Phys. Conf. Ser.*, 1245(1), 1-7

- Kaur, P., and Kaur, P., 2024, Insights into adsorption performance and mechanism of chitosan-bentonite biocomposites for removal of imazethapyr and imazamox, *Int. J. Biol. Macromol.*, 262, 2-14.
- Kecili, R., and Hussain, C.M., 2018, Mechanisme 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. Pollut. Res.*, 30, 29566–29580.
- Koutenaei, S.S., Vatankhah, G., and Esmaeili, H., 2022, Ziziphus spinachristi Leaves Biochar Decorated with Fe₃O₄ and SDS for Sorption of Chromium (III) from Aqueous Solution, *Biomass Convers. Biorefinery*, 1, 1–14.
- Laysandra, L., Fabryanty, R., Ju, Y.H., Putro, J.N., Santoso, S.P., Soetaredjo, F.E., Kurniawan, A., and Ismadji, S., 2019, Renewable rarasaponin-bentonite-alginate composite with sponge-like structure and its application for crystal violet removal from aqueous solution, *Desalination Water Treat.*, 160, 354–365.
- Lee, S.J., Jeong, J.R., Shin, S.C., Kim, J.C., and Kim, J.D., 2004, Synthesis and Characterization of Superparamagnetic Maghemite Nanoparticles Prepared by Coprecipitation Technique, *J. Magn. Magn. Mater.*, 282, 147–150.
- Mar, K.K., Karnawati, D., Sarto, Putra, D.P.E., and Igarashi, T., 2013, Comparison of arsenic adsorption on lignite, bentonite, shale, and iron sand from Indonesia, *Procedia Earth Planet. Sci.*, 6, 242–250.
- Nyankson, E., Adjasoo, J., Efavi, J.K., Amedalor, R., Yaya, A., Manu, G.P., Asare, K., and Amartey, N.A., 2019, Characterization and Evaluation of Zeolite A/Fe₃O₄ Nanocomposite as A Potential Adsorbent for Removal of Organic Molecules from Wastewater, *J. Chem.*, 2019, 1–13.
- Obsa, A.L., Shibeshi, N.T., Mulugeta, E., and Workeneh, G.A., 2025, Eco-friendly composite hydrogel based on cellulose and bentonite for removal of lead

- (II): Kinetics and isotherm studies, *Carbohydr. Polym. Technol. Appl.*, 9, 1-13.
- 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. SynchrotronRad.*, 19, 759–767.
- Oussalah, A., Boukerroui, A., Aichour, A., and Djellouli, B., 2019, Cationic and anionic dyes removal by low-cost hybrid alginate/natural bentonite composite beads: Adsorption and reusability studies, *Int. J. Biol. Macromol.*, 124, 854–862.
- Pambudi, T., and Umam, H. I., 2023, Synthesis of Magnetite-Modified Natural Zeolite Using Coprecipitation and Physical Mixing Techniques, *Indonesian Journal of Pure and Applied Chemistry*, 6(3), 122-131.
- Pambudi, T., Wahyuni, E.T., and Mudasir, M., 2020, Recorverable Adsorbent of Natural Zeolite/ Fe^3O_4 for Removal of Pb(II) In Water, *J. Mater. Environ. Sci.*, 1(11), 69-78.
- Park, J.H., Wang, J.J., Kim, S.H., Kang, S.W., Jeong, C.Y., Jeon, J.R., Park, K.H., Cho, J.S., Delaune, R.D., and Seo, D.C., 2019, Cadmium Adsorption Characteristics of Biochars Derived using Various Pine Tree Residues and Pyrolysis Temperatures, *J. Colloid Interface Sci.*, 553, 298–307.
- Pawar, R.R., Lalmunsiam, Ingole, P.G., and Lee, S.M., 2020, Use of activated bentonite-alginate composite beads for efficient removal of toxic Cu^{2+} and Pb^{2+} ions from aquatic environment, *Int. J. Biol. Macromol.*, 164, 3145–3154.
- Piccin, J.S., Dotto, G.L., and Pinto, L.A.A., 2011, Adsorption Isotherms and Thermochemical Data of FD&C Red n 40 Binding by Chitosan, *Braz. J. Chem. Eng.*, 28, 295–304.
- Pierrard, M.A., Kestemont, P., Delaive, E., Dieu, M., Raes, M., and Silvestre, F., 2012, Malachite green toxicity assessed on Asian catfish primary cultures of peripheral blood mononuclear cells by a proteomic analysis, *Aquat. Toxicol.*, 114–115, 142–152.

- Purnomo, A.S., Hairunnisa, F.W., Misdar, Maria, V.P., Rohmah, A.A., Putra, S.R., Putro, H.S., and Rizqi, H.D., 2024, Anionic dye removal by immobilized bacteria into alginate-polyvinyl alcohol-bentonite matrix, *Heliyon*, 10(6), 1-9.
- 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.
- Ravi, L., and Pandey, L. M., 2019, Enhanced adsorption capacity of designed bentonite and alginate beads for the effective removal of methylene blue, *Appl. Clay Sci.*, 169, 102–111.
- Ray, S., Kumar Mishra, A., and Kalamdhad, A.S., 2021, Evaluation of equilibrium, kinetic and hydraulic characteristics of Indian bentonites in presence of heavy metal for landfill application, *J. Clean Prod.*, 317, 1-10.
- Revellame, E.D., Fortela, D.L., Sharp, W., Hernandez, R., and Zappi, M. E., 2020, Adsorption Kinetic Modeling Using Pseudo-First Order and Pseudo-Second Order Rate Laws: A Review, *Clean. Eng. Technol.*, 1, 1-13.
- Riapanitra, A., dan Andreas, R., 2010, Pemanfaatan Arang Batok Kelapa dan Tanah Humus Baturraden untuk Menurunkan Kadar Logam Krom (Cr), *Molekul*, 5(2), 66-74.
- Sahoo, T.R. and Prelot, B., 2020, Adsorption Processes for The Removal of Contaminants from Wastewater: The Perspective Role of Nanomaterials and Nanotechnology, *Nanomater. Detect. Remov. Wastewater Pollut.*, 161–222.
- Sawyer, C.N., McCarty, P.L., dan Parkin, G.F., 2003, *Chemistry for Environmental Engineering and Science*, 5th Ed., McGraw-Hill Education, Boston.
- Shah, L.A., Subhan, H., Alam, S., Ye, D., and Ullah, M., 2024, Bentonite clay reinforced alginate grafted composite hydrogel with remarkable sorptive performance toward removal of methylene green, *Int. J. Biol. Macromol.*, 279(4), 1-12.
- Sharma, J., Sharma, S., and Soni, V., 2023, Toxicity of malachite green on plants and its phytoremediation: A review, *Reg. Stud. Mar. Sci.*, 62, 1-16.

- Susarla, S.M., Mulliken, J.B., Kaban, L.B., Manson, P.N, and Dodson, T.B., 2017, The colourful history of malachite green: from ancient Egypt to modern surgery, *Int. J. Oral Maxillofac. Surg.*, 46, 401–403.
- Temkin, M., and Pyshev, V., 1940, Kinetics of Ammonia Synthesis on Promoted Iron Catalysts, *Acta Physicochim. URSS*, 12, 217–222.
- Tukan, D.N., Tambunan, L.R., Kustomo, dan Rasidah, A Review : Optimum Conditions for Magnetite Synthesis (Fe_3O_4), *Jurnal Ilmiah Berkala: Sains dan Terapan Kimia*, 17(2), 15-21.
- Wang, J., and Guo, X., 2020, Adsorption Isotherm Models: Classification, Physical Meaning, Application and Solving Method, *Chemosphere*, 258, 1-25.
- 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.
- Waynert, J., 2003, Wastewater Treatment with Magnetic Separation, *Superconductivity for Electric Systems Program Review*, 1, 1-29.
- 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, *J. Clean. Prod.*, 313, 1–13.
- Xie, J., Peng, T., Chen, D.D., Zhang, Q.J., Wang, G.M., Wang, X., Guo, Q., Jiang, F., Chen, D., and Deng, J., 2013, Determination of malachite green, crystal violet and their leuco-metabolites in fish by HPLC-VIS detection after immunoaffinity column clean-up, *J. Chromatogr. B Analyt. Technol. Biomed. Life Sci.*, 913–914, 123–128.
- 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. Manage.*, 260, 1-8.
- Yeo, J. Y. J., Bergaoui, M., Nakhli, A., Khaerudini, D. S., Soetaredjo, F. E., Ismadji, S., Sunarso, J., Al-Hada, N. M., Al-Asbahi, B. A., and Khalfaoui, M., 2025, Exploring interface interactions in antibiotics adsorption on bentonite-

alginate composite: Insights from advanced simulations and adsorption isotherms modelling, *Surf. Interfaces.*, 60, 1-14.

Yildirim, A., and Acay, H., 2025, Methylene blue and malachite green dyes adsorption onto russula delica/bentonite/tripolyphosphate, *Heliyon*, 11(1), 1-17.

Yuliana, M., Ismadji, S., Lie, J., Santoso, S. P., Soetaredjo, F. E., Waworuntu, G., Putro, J. N., and Wijaya, C. J., 2022, Low-cost structured alginate-immobilized bentonite beads designed for an effective removal of persistent antibiotics from aqueous solution, *Environ. Res.*, 207, 1-10.

Zhang, B., Zhu, W., Hou, R., Yue, Y., Feng, J., Ishag, A., Wang, X., Qin, Y., and Sun, Y., 2024, Recent advances of application of bentonite-based composites in the environmental remediation, *J. Environ. Manage.*, 362, 1-17.