

## DAFTAR PUSTAKA

- Adamson, A.W., 1990, *Physical Chemistry of Surfaces*, 5<sup>th</sup> Edition, John Wiley and Sons Inc., New York.
- Ahmed, M.A., Abou-Gamra, Z.M., and Salem, A.M., 2017, Photocatalytic Degradation of Methylene Blue Dye Over Novel Spherical Mesoporous Cr<sub>2</sub>O<sub>3</sub>/TiO<sub>2</sub> Nanoparticles Prepared by Sol-gel Using Octadecylamine Template, *J. Environ. Chem. Eng.*, 5(5), 4251-4261.
- Alizadeh, N., Shariati, S., and Besharati, N., 2017, Adsorption of Crystal Violet and Methylene Blue on Azolla and Fig Leaves Modified with Magnetite Iron Oxide Nanoparticles, *Int. J. Environ. Res.*, 11(2), 197-206.
- Al-Sabagh, A.M., Mustofa, Y.M., Hamdy, A., Killa, H.M., Ghanem, R.T.M., and Morsi, R.E., 2018, Preparation and Characterization of Sulfonated Polystyrene/magnetite Nanocomposites for Organic Dye Adsorption, *Egypt. J. Pet.*, 27(2018), 403-413.
- Altintig, E., Altundag, H., Tuzen, M., and Sari, A., 2017, Effective Removal of Methylene Blue from Aqueous Solutions Using Magnetic Loaded Activated Carbon as Novel Adsorbent, *Chem. Eng. Res. Des.*, 122(2017), 151-163.
- Anouzla, A., Abrouki, Y., Souabi, S., Safi, M., Rhabl, H., 2009, Colour and COD Removal of Disperse Dye Solution by Novel Coagulant: Application of Statistical Design for the Optimazation and Regression Analysis, *J. Hazard. Mater.*, 166 (2009), 1302-1306.
- Atkins, P., and De Paula, J., 2010, *Physical Chemistry 9th Edition*, W.H. Freeman and Co., New York.
- Badi, M.Y., Azari, A., Pasalari, H., Esrafil, A., Farzadkia, M., 2018, Modofication of Activated Carbon with Magnetic Fe<sub>3</sub>O<sub>4</sub> Nanoparticle Composite for Removal of Ceftriaxone from Aquatic Solution, *J.Mol.Liq.*, 261, 146-154.
- Bandpi, A.M., Tariq, J.A., Esmail, G., Mansur, Z., Samira, M., and Shiva, A.V., 2016, Improvement of Zeolite Adsorption Capacity for Cephalixin by Coating with Magnetic Fe<sub>3</sub>O<sub>4</sub> Nanoparticles, *J.Mol.Liq.*, 218, 615-624.
- Benhouria, A., Islam, M.A., Zaghoulane-Boudiaf, H., Boutahala, M., Hameed, B., 2015, Calcium Alginate-Bentonite-Activated Carbon Composite Beads as Highly Effective Adsorbent for Methylene Blue, *Chem. Eng. J.*, 270(2015), 621-630.
- Bekri-Abbes, I., Bayoudh, S., Baklouti, M., 2006, Converting Waste Polystyrene into Adsorbent: Potential Use in the Removal of Lead and Cadmium Ions from Aqueous Solution, *J. Polym Environ.*, 14(2006), 249-256.
- Boparai, H.K., Joseph, D.M., and O'Carroll, D.M., 2010, Kinetics and Thermodynamics of Cadmium Ion Removal by Adsorption onto Nanozerovalent Iron Particles, *J. Hazard. Mater.*, 186(1), 458-465.

- Boumediene, M., Benaissa, H., George, B., Molinda, St., and Merlin, A., 2018, Effects of pH and Ionic Strength on Methylene Blue Removal from Synthetic Aqueous Solutions by Sorption onto Orange Peel and Desorption Study, *J.Mater. Environ. Sci.*, 9(6), 1700-1711.
- Bujdák, J and Komadel, P., Interaction of Methylene Blue with Reduced Charge Montmorillonite, *J. Phys. Chem.B.*, 44(101), 9065-9068.
- Cahyadi, A., Aini, S., and Sanjaya, H., 2019, Impregnation of Synthesized Fe<sub>3</sub>O<sub>4</sub>-Fe<sub>2</sub>O<sub>3</sub> Nanoparticles Mixture from Iron Sand into Mesoporous Silica, *Int. J. Sci. Res. Eng. Dev.*, 2, 626–628.
- Chang, J., Ma, J, Ma, Q., Zhang, D., Qiao, N., and Hu, M., 2016, Adsorption of Methylene Blue onto Fe<sub>3</sub>O<sub>4</sub>/activated Montmorillonite Nanocomposite, *Appl. Clay. Sci.*, 119(2016), 132-140.
- Cornell, R.M., and Schwertmann, U., 2003, *Iron Oxide in the Laboratory*, VCH, New York.
- Cotto-Maldonado, M.D., Duconge, J., Morant, C., and Márquez, F., 2017, Fenton Process for the Degradation of Methylene Blue using Different Nanostructured Catalysts, *Am. J. Eng. Appl. Sci.*, 10 (2), 373-38.
- Farrelly, T.A, and Ian, C.S, 2017, *Household Hazardous Waste Management Chapter 4 (Polystyrene as Hazardous Household Waste)*, Intech Open, London.
- Ferreira, S.A.D., Donadia, J.F., Goncalves, G.R., Teixeira, A.I., Freitas, M.B.J.G., Fernades, A.A.R., and Lelis, M.F.F., 2019, Photocatalytic Performance of Granite Waste in the Decolorization and Degradation of Reactive Orange 122, *J. Environ. Chem. Eng.*, 7(2019), 1-7.
- Foo, K., and Hameed, B., 2010, Insights into The Modelling of Adsorption Isotherm Systems, *Chem. Eng. J.*, 156(1), 2-10.
- Ghazanfari, M. R., Kashefi, M., Shams, S. F., Jaafari, M. R., 2016, Perspective of Fe<sub>3</sub>O<sub>4</sub> Nanoparticles Role in Biomedical Applications. *Biochem. Res. Int.*, (2016), 1- 32.
- Gupta, N., Kushwaha, A.K., and Chattopadhyaya, M.C., 2016, Application of Potato (*Solanum tuberosum*) Plant Wastes for the Removal of Methylene Blue and Malachite Green Dye from Aqueous Solution, *Arabian.J. Chem.*, 9(2016), 707-716.
- Hameed, B.H., Din, A.T.M., and Ahmad A.L., 2007, Adsorption of Methyleen Blue Onto Bamboo Based Activated Carbon: Kinetics and Equilibrium Studies, *J. Hazard. Mater.*, 141(3), 819-825.
- Hertel, T., Rui, M.N., Roberto, M.A., Joao, A.L., and Yiannis P., 2019, Use of Modified Bauxite Residue-Based Porous Inorganic Polymer Monoliths as Adsorbent of Methylene Blue, *J. Clean. Prod.*, 227(2019), 877-889.

- Hernandez, J.S.T., Muriel, A.A., Tabares, J.A., Alcázar, G.A.P., and Bolaños, A., 2015, Preparation of Fe<sub>3</sub>O<sub>4</sub> Nanoparticles and Removal of Methylene Blue through Adsorption. *J. Phys. Conf.*, 614(2015), 1-4.
- Ho, Y.S., 2006, Review of Second Order Models for Adsorption Systems, *J. Hazard. Mater.*, B136, 681-689.
- Huang, X., Bu, H., Jiang, G., and Zeng, M., 2011, Cross-Linked Succinyl Chitosan as An Adsorbent for the Removal of Methylene Blue from Aqueous Solutions, *Int. J. Biol. Macromoll*, 49(4), 643-651.
- Hidayat, Y.A., Kiranamahsa, S., and Zamal, M.A., 2019, A Study of Plastic Waste Management Effectiveness in Indonesia Industries, *AIMS Energy*, 7(3), 350-370.
- Iwasaki, T., Kosaka, K., Mizutani, N., Watano, S., Yanagida, T., Tanaka, H., and Kawai, T., 2008, Mechanochemical Preparation of Magnetite Nanoparticles by Coprecipitation, *Mater. Lett.*, 62, 4155-4157.
- Jamwal, H.S., Kumari, S., Chauha, G.S., Reddyb, N.S., and Ahn, J.H., 2017, Silica-Polymer Hybrid Materials as Methylene Blue Adsorbents, *J. Environ. Chem. Eng.*, 5, 103-113.
- Jancar, P., Kucera, A., and Mayr, R., 2001, Deciding Bisimulation the Equivalences with Finite-state Process, *Theor. Comput. Sci.*, 258(2001), 409-433.
- Kasperchik, V.P., Yaskevich, A.L., and Bil 'dyukevich, A.V., 2012, Wastewater Treatment for Removal of Dyes by Coagulation and Membrane Processes, *Pet. Chem.*, 52(7), 545-556.
- Khoshsang, H., Ghaffarinejad, A., Kazemi, H., and Jabarian, S., 2018, Synthesis of Mesoporous Fe<sub>3</sub>O<sub>4</sub> and Fe<sub>3</sub>O<sub>4</sub>/ C Nanocomposite for Removal of Hazardous Dye from Aqueous Media, *J. Water. Environ. Nanotechnol.*, 3(3), 191-206.
- Koo, K.N., Ismail, A.F., Othman, M.H.D., Rahman, M.A., Sheng, T.Z., 2019, Preparation and Characterization of Superparamagnetic Magnetite (Fe<sub>3</sub>O<sub>4</sub>) Nanoparticles: A short review, *Mal. J. Fund. Appl. Sci.*, 1(15), 23-31.
- Körbahti, B.K. Artut, K., Gecgel, C., and Özer, 2011, Electrochemical Decolorization of Textile Dyes and Removal of Metal Ions from Textile Dye and etal Binary Mixtures, *Chem. Eng. J.*, 173, 677-688.
- Lou, T., Cui, G., Xun, J., Wang, X., Feng, N., and Zhang, J., 2018, Synthesis of Terpolymer Based on Chitosan and Lignin as an Effective Flocculant FOR Dye Removal, *Colloids Surf. A Physicochem. Eng. Asp.*, 537, 149-154.
- Lyu, H., Gaoc, B., Hed, F., Zimmermane, A.R., Ding, C., Tang, J., and Crittenden, J.C., 2017, Experimental and Modeling Investigations of Ball-milled Biochar for the Removal of Aqueous Methylene Blue, *Chem. Eng. J.*, (335), 110-119.
- Maity, S., Chaterjee, A., Guchhait, R., De, S., and Pramanick, K., 2019, Cytogenotoxic Potential of a Hazardous Material, Polystyrene Microparticles on *Allium cepa* L., *J. Hazard. Mater.*, 385(2020), 1-10.

- Mahmoud, M.E., Abdou, A.E.H., Ahmed, S.B., 2016, Conversion of Waste Styrofoam into Engineered Adsorbents for Efficient Removal of Cadmium, Lead, and Mercury from Water, *ACS Sustainable Chem. Eng.*, 4, 819-827.
- Martins, C.R., Ruggeri, G., and De Paoli, M.A., 2003, Synthesis in Pilot Plant Scale and Physical Properties of Sulfonated Polystyrene, *J. Braz. Chem. Soc.*, 14, 797-802.
- Meili, L., Lins, P.V., Zanta, C.L.P.S., Soletti, J.I., Ribeiro, L.M.O., Dornelas, C.B., Silva, T.L., and Vieira, M.G.A., 2019, MgAl-LDH/Biochar Composites for Methylene Blue Removal by Adsorption, *Appl. Clay. Sci.*, (168), 11-20.
- Mohseni-Bandpi, A., Al-Musawi, T.J., Ghahramani, E., Zarrabi, M., Mohebi, S., and Vahed, S.A., 2016, Improvement of Zeolite Adsorption Capacity for Cephalexin by Coating with Magnetic Fe<sub>3</sub>O<sub>4</sub> Nanoparticles, *J. Mol. Liq.*, 218, 615-624.
- Mouni, L., Belkhiri, L., Bollinger, J.C., Bouzaza, A., Assadi, A., Tirri, A., Dahmoune, F., Madani, K., and Remini, H., 2018, Removal of Methylene Blue from Aqueous Solutions by Adsorption on Kaolin: Kinetic and Equilibrium Studies, *Applied. Clay. Sci.*, (153), 38-45.
- Mtshatsheni, K.N.G., Ofomaja, A.E., and Naidoo, E.B., 2019, Synthesis and Optimization of Reaction Variables in the Preparation of Pine-magnetite Composite for Removal of Methylene Blue Dye, *S. Afr. J. Chem. Eng.*, 29, 33-41.
- Milla, I.M.N., 2018, Sulfonasi Limbah Styrofoam Sebagai Adsorben untuk Penghilangan ion Cd(II) Dalam Larutan, *Skripsi*, Departemen Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Gadjah Mada, Yogyakarta
- Milla, I.M.N., Syahri, M.A., Wahyuni, E.T., Roto, R., and Siswanta, D., 2018, Modification of Styrofoam Waste as a Low-Cost Adsorbent for Removal of Cadmium Ion in Aqueous Solution, *Orient. J. Phys. Sciences*, 2(3), 127-142.
- Ogemdi, I.K., 2018, Removal of Heavy Metals from Their Solution Using Polystyrene Adsorbent (Foil Take Away Disposable Plates), *Int. J. Environ. Chem.*, 2(2), 29-38.
- Omapas, M.R.G., Puebla, A.C.N., Rivera, M.J.K.G., Tocaldo, J.E.D., Villagrancia, R.R., Roque, E.C., and Arcega, A., 2015, Evaluation of the efficiency of sulfonated polystyrene in the removal of Cd<sup>2+</sup> from groundwater, *J. Eng. Sci. Technol.*, 10, 24-35.
- Oscik, J and Cooper, I.L., 1982, *Adsorption*, Ellis Horwood Ltd. Chichester.
- Oyelude, E.O. and Appiyah-Takyi, F., 2012, Removal of Methylene Blue from Aqueous Solution Using Alkali-modified Malted Sorghum Mash, *Turk. J. Eng. Environ. Sci.*, 36, 161-169.

- Oz, M., Lorke, D.E., Hasan, M. Petroianu, G.A., Cellular and Molecular Actions of Methylene Blue in the Nervous System, *Med. Res. Rev.*, 31, 93-117.
- Pambudi, T., 2019, Adsorpsi Ion Pb(II) Menggunakan Zeolit Alam Termagnetisasi Fe<sub>3</sub>O<sub>4</sub>, *Tesis*, Departemen Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Gadjah Mada, Yogyakarta.
- Pambudi, T., Wahyuni, E.T., and Mudasir, M., 2020, Recorverable Adsorbent of Natural Zeolite/ Fe<sub>3</sub>O<sub>4</sub> for Removal of Pb(II) in Water, *J. Mater. Environ. Sci.*, 1(11), 69-78.
- Pannerselvan, P., Morad, N., Tan, K.A., 2011, Magentic Nanoparticle (Fe<sub>3</sub>O<sub>4</sub>) Impregnated onto Tea Waste for Removal of Nickel(II) from Aqueous Solution, *J. Hazard. Matter.*, 186, 160-168.
- Papegowda, P.K. and Syed, A.A., 2017, Isotherm, Kinetic and Thermodynamic Studies on the Removal of Methylene Blue Dye from Aqueous Solution Using Saw Palmetto Spent, *Int. J. Environ. Res.*, 11, 91–98.
- Pathania, D., Sharma, S., and Singh, P., 2017, Removal of Methylene Blue by Adsorption onto Activated Carbon Developed from Ficus carica Bast, *Arab. J. Chem.*, 1(10), 1445-1451.
- Petrella, A., Mundo, R.D., and Notarnicola, M., 2020, Recycled Expanded Polystyrene as Lightweight Aggregate for Environmentally Sustainable Cement Conglomerates, *Material*, 13, 1-17.
- Rendo, D., 2019, Penanganan Limbah Zat Warna Biru Metilen Menggunakan Adsorben Zeolit Alam Termagnetisasi Fe<sub>3</sub>O<sub>4</sub>, *Tesis*, Departemen Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Gadjah Mada, Yogyakarta.
- Reza, K.M., Kумы, A., and Gulshan. F., 2016, Photocatalytic Degradation of Methylene Blue by Magnetite+H<sub>2</sub>O<sub>2</sub>+UV Process, *Int. J. Environ. Sci. Dev.*, 5 (7), 325-329.
- Rozaini, C.A., Jaim, K., Oo, C.W., Tan, K.W., Tan, L.S., Azraa, A., and Tong, K.S., 2010, Optimization of Nickel and Copper Ions Removal by Modified Mangrove Barks, *Chem. Eng. J.*, 1(1), 84-89.
- Ruziwa, D., Chaukura, N., Gwenzi, W., and Pumure, I., 2015, Removal of Zn<sup>2+</sup> and Pb<sup>2+</sup> ions from Aqueous Solution Using Sulphonated Waste Polystyrene, *J. Environ. Chem. Eng.*, 3, 2528-2537.
- Sahunin, C., Kaewboran, J., and Hunson, M., 2006, Treatment of Textile Dyeing Wastewater by Photo Oxidation using UV/H<sub>2</sub>O<sub>2</sub>/Fe<sup>2+</sup> Reagents, *Sci. Asia.*, 32(2006), 181-186.
- Saini, J., Garg, V.K., and Gupta, R.K., 2018, Removal of Methylene Blue from Aqueous Solution by Fe<sub>3</sub>O<sub>4</sub>@Ag/SiO<sub>2</sub> nanospheres: Synthesis, Characterization, and Adsorption Performance, *J. Mol. Liq.*, 250, 413-422.



- Salazar-Rabago, J.J., Leyva-Ramos, R., Rivera-Utrilla, J., Ocampo-Perez, R., and Cerino-Cordova, F.J., 2017, Biosorption Mechanism of Methylene Blue from Aqueous Solution onto White Pine (*Pinus durangensis*) Sawdust: Effect of Operating Conditions, *Sustain. Environ. Res.*, 27, 32-40.
- Salleh, M.A.M., Mahmoud, D.K., Karim, W.A.W.A., and Idris, A., 2011, Cationic and Anionic Dye Adsorption by Agricultural Solid Wastes: a Comprehensive Review, *Desalination*, 280, 1-13.
- Shah, K.H., Ali, S., Waseem, M., Shah, F., Fahad, M., Shahida, S., Khan, A.M., and Khan, A.R., 2019, Native and Magnetic Oxide Nanoparticles (Fe<sub>3</sub>O<sub>4</sub>) Impregnated Bentonite Clays as Economic Adsorbents for Cr(III) Removal, *J. Solution. Chem.*, 48, 1640-1659.
- Somsesta, N., and Sricharoenchaikulb, V., 2020, Adsorption Removal of Methylene Blue onto Activated Carbon/cellulose Biocomposite Films: Equilibrium and Kinetic Studies, *Mater. Chem. Phys.*, 240, 1-14.
- Staron, P., Chwastowski, J., and Banach, M., 2019, Sorption Behavior of Methylene Blue from Aqueous Solution by *raphia* fibers, *Int. J. Environ. Sci. Te.*, 16, 8449-8460.
- Sulkowski, W.W., Wowak, K., Sulkowska, A., Wolinska, A., and Mikula, B., 2009, Study of the Sulfonation of Expanded Polystyrene Waste and of Properties of the Products Obtained, *Pure. Appl. Chem.*, 12(81), 2417-2424.
- Syahri, M.A., 2017, Pemanfaatan Limbah Styrofoam Tersulfonasi Sebagai Adsorben untuk Penghilang Ion Logam Cd(II) di Perairan, *Skripsi*, Departemen Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Gadjah Mada, Yogyakarta.
- Tabekh, H., Al-Kurdi, M.H., and Ajji, Z., 2015, Sulphonation of Expanded Polystyrene Waste with Commercial Sulphuric Acid for Potential Use in Removal of Heavy Metals from Contaminated Waters, *Polimeri*, 36(2015), 11-14.
- Türgay, O., Ersöz, G., Atalay, S., Forss, J., Welandar, U., 2011, The Treatment of Azo Dyes Found in Textile Industry Wastewater byb Anaerobic Biological Method and Chemical Oxidation, *Sep. Purif. Technol.*, 79, 26-33.
- Valdés, H., Tardón, R.F., and Zaror, C.A., 2009, Methylene Blue Removal from Contaminated Waters Using O<sub>3</sub>, Natural Zeolite, and O<sub>3</sub>/zeolite, *Water. Sci. Technol.*, 60(6), 1419-1424.
- Wang, S., and Ariyanto, E., 2007, Competitive Adsorption of Malachite Green and Pb Ions on Natural Zeolite, *J. Colloid. Interface. Sci.*, 314, 25-31.
- Wu, K., Liang, G., Wei, X., Hengyi, X., Zoraida, P.A., Guamao, X., Weihua, L., Yonghua X., and Yiqun, W., 2014, Sulfoanted Polystyrene Magnetic Nanobeads Copuled with Immunochromatographic Strip for Clenbuterol Determination in Pork Muscle, *Talanta*, 129, 431-437.

- Yang, S.S., Brandon, A.M., Xing, D.F., Yang, J., Pang, J.W., Criddle, C.S., Ren, N.Q., and Wu, W.M., 2018, Progresses in Polystyrene Biodegradation and Prospects for Solution to Plastic Waste Pollution, *IOP Conf. Ser. Earth Environ. Sci.*, 150, 1-9.
- Yin, L., Jiang C., Wen, X., Du, C., Zhong, W., Feng, Z., Long, Y.M and Ma., Y., 2019, Microplastic Pollution in Surface Water of Urban Lakes in Changsha, China, *Int. J. Environ. Res. Health*, 16 (1650), 1-10.
- Yuan, M., Xie, T., Yan, G., Chen, Q., and Wang, L., 2018, Effective Removal of  $Pb^{2+}$  from Aqueous Solutions by Magnetically Modified Zeolite, *Powder Technol.*, 32, 234-241.
- Zhang, J., Lee, K.H., and Cui, L., 2009, Degradation of Methylene Blue in Aqueous Solution by Ozone-based Processes, *J. Ind. Eng. Chem.*, 15(2), 185-189.
- Zhang, X., Zhang, P., Wu, Z., Zhang, L., Zeng, G., and Zhou, C., 2013, Adsorption of Methylene Blue onto Humic Acid-coated  $Fe_3O_4$  nanoparticles, *Colloids. Surf. A.*, 435, 85-90.