



DAFTAR PUSTAKA

- Adamczuk, A. and Kołodyńska, D., 2015, Equilibrium, Thermodynamic and Kinetic Studies on Removal of Chromium, Copper, Zinc and Arsenic from Aqueous Solutions onto Fly Ash Coated by Chitosan, *Chem. Eng. J.*, 274, 200–212.
- Adamson, A.W., 1990, *Physical Chemistry of Surface*, 5th Ed., John Wiley and Son Inc., New York.
- Adebowale, I.E. Unuabonah, B.I., and Olu-Owolabi, 2006, The Effect of Some Operating Variables on The Adsorption of Lead and Cadmium Ions on Kaolinite Clay, *J. Hazard. Mater.*, 134, 130-139.
- Al'a'raf, L.M.S., 2018, Studi Imobilisasi pada Slag Nikel untuk Adsorpsi Logam Berat Cd(II) dan Cu(II), *Tesis*, Universitas Gadjah Mada, Yogyakarta.
- Alver, E. and Metin, A. ü., 2012, Anionic Dye Removal from Aqueous Solutions Using Modified Zeolite: Adsorption Kinetics and Isotherm Studies, *Chem. Eng. J.*, 200–202, 59–67.
- Anirudhan, S., Deepa, J.R., and Christa, J., 2016, Nanocellulose/Nanobentonite Composite Anchored with Multi-Carboxyl Functional Groups as An Adsorbent for The Effective Removal of Cobalt(II) from Nuclear Industry Wastewater Samples, *J. Colloid Interface Sci.*, 467, 307-320.
- Anonim, 2010, *Keputusan Menteri Kesehatan Republik Indonesia Tentang Syarat-Syarat dan Pengawasan Kualitas Air Minum*, 492.
- Anonim, 2014, *Keputusan Menteri Kesehatan Republik Indonesia Tentang Baku Mutu Air Limbah*, 05.
- Anonim, 2019, *Kementerian Energi dan Sumber Daya Mineral (ESDM) Republik Indonesia Tentang Cadangan Bijih Nikel Indonesia*.
- Baselt, R., 2008, Disposition of Toxic Drugs and Chemicals in Man (8th Ed.), *Biomedical Publications.*, 1429–1431.
- Beh, C.L., Chuah, T.G., Nourozi, M.N., and Chong, T.S.Y., 2012, Removal of Heavy Metals from Steel Making Waste Water by Using Electric Arc Furnace Slag, *E-J. Chem.*, 9(4), 2557-2564.



- Belova, T.P., 2019, Adsorption of Heavy Metal Ions (Cu^{2+} , Ni^{2+} , Co^{2+} and Fe^{2+}) from Aqueous Solutions by Natural Zeolite, *J. Heliyon*, 5 (9), 02320.
- Burat, F., Basturkcu, H., and Ozer, M., 2019, Gold and Silver Recovery from Jewelry Waste with Combination of Physical and Physicochemical Methods, *J. Waste Manag.*, 89, 10-20.
- Chen, X., Hou, W.H., Song, G.L., and Wang, Q.H., 2011, Adsorption of Cu, Cd, Zn, and Pb Ions from Aqueous Solutions by Electric Arc Furnace Slag and the Effects of pH and Grain Size, *Chem. Biochem. Eng.*, 25 (1), 105–114
- Freundlich, H.M.F., 1906, Over the Adsorption in Solution, *J. Phys. Chem*, 57, 385-470
- Gao, H., Song, Z., Zhang, W., Yang, X., Wang, X., and Wang, D., 2017, Synthesis of Highly Effective Absorbents with Waste Quenching Blast Furnace Slag to Remove Methyl Orange from Aqueous Solution, *J. Envir. Sci.*, 53, 68-77.
- Hammond, C. R., 2004, *The Elements, in Handbook of Chemistry and Physics* (81st Ed.), CRC press.
- Hardyanti, Ika, S., Isni, N., Dyan, S.H.P, Evalisa, A., and Emas, A. P.W., 2017, Utilization of Silica (SiO_2) and Bentonite as Adsorbents of Heavy Metal Fe in Batik Waste, *J. Environ. Chem. Eng.*, 3 (2) 37-4.
- He, M., Zhu, Y., Yang, Y., Han, B., and Zhang, Y. 2011. Adsorption of Cobalt(II) Ions from Aqueous Solutions by Palygorskite, *Appl. Clay Sci.*, 54(3–4), 292–296
- Ho, Y.S. and McKay, G., 1999, Pseudo-second Order Model for Sorption Processes, *Process Biochem.*, 34(5), 451-465.
- Huda, B.N., Wahyuni, E.T., and Mudasir, 2021, Eco-Friendly Immobilization of Dithizone on Coal Bottom Ash for The Adsorption of Lead(II) Ion from Water, *Rineng*, 10, 100221.
- Koduru, J.R., Chang, Y.Y., Yang, J.K., and Kim, I.S., 2013, Iron Oxide Impregnated Morus alba L. Fruit Peel for Biosorption of Co(II): Biosorption Properties and Mechanism, *Sci. World J.*, 2013, 1-14.



- Kokkinos, C. and Economou, A., 2016, Microfabricated Chip Integrating A Bismuth Microelectrode Array for the Determination of Trace Cobalt(II) by Adsorptive Cathodic Stripping Voltammetry, *Sens. Actuat. B: Chem.*, 229, 362-369.
- Kyzas, G.Z., Deliyanni, E.A., and Matis, A.K., 2016, Activated Carbons Produced by Pyrolysis of Waste Potato Peels: Cobalt Ions Removal by Adsorption, *Colloids Surf. A: Physicochem. Eng. Asp.*, 490, 74-83.
- Langmuir, I., 1916, The Constitution and Fundamental Properties of Solids and Liquids. Part I Solids, *J. Am. Chem. Soc.*, 38 (11), 2221-2295.
- Lin, L., and Yu, Y., 2006, Application of Modified Nickel Slag Adsorbent on the Removal of Pb²⁺ and Cu²⁺ from Aqueous Solution, *Chinese J. Struct. Chem.*, 35(6), 879-888.
- Lingamdinne, L.P., Koduru, J.R., Roh, H., Choi, Y.L., Chang, Y.Y., and Yang, J.K., 2016, Adsorption Removal of Co(II) from Waste-Water Using Graphene Oxide, *Hydrometallurgy*, 165 (1), 90-96.
- Mahmoud, M.E., Osman, M.M., Hafez, O.F., Hegazi, A.H., and Elmelegy, E., 2010, Removal and Preconcentration of Lead(II) and other Heavy Metals from Water by Alumina Adsorbents Developed by Surface-adsorbed-dithizone, *Desalination*, 251(1-3), 123-130.
- Martinez-Abad, A., Ocio, M. J., Lagaron, J. M., and Sanchez, G., 2013, Evaluation of Silver-Infused Polylactide Films for Inactivation of Salmonella and Feline Calicivirus in Vitro and on Fresh-Cut Vegetables, *Int. J. Food Microbiol.*, 162 (1), 89-94.
- Miao, G. J., Sheng, W.Q., Yan, L.X., and Tong, Z.X., 2016, Hydrothermal Synthesis of Nickel Slag Aerated Concrete and Its Hydration Reaction, *J. Mater. Sci. Eng.*, 34 (3), 421-426.
- Mishra, I.M., Wasewar, K.L., Atif, M., and Prasad, B., 2009, Batch Adsorption of Zinc on Tea Factory Waste, *Desalination*, 244(1-3), 66-71.
- Mohan, D., Sarswat, A., Ok, Y.S., and Pitmann, C.U.J., 2014, Organic and Inorganic Contaminants Removal from Water with Biochar, A Renewable, Low Cost and Sustainable Adsorbent – A Critical Review, *J. Bioresour. Tech.*, 160, 191-202.



- Mubarok, M.Z. and Yudiarto, A., 2017, Synthesis of Magnesium Oxide from Ferronickel Smelting *Slag* Through Hydrochloric Acid Leaching-Precipitation and Calcination, *Miner. Met. Mater. Ser.*, 247-257.
- Mudasir, M., Baskara, R.A., Suratman, A., Yunita, K.S., Perdana, R., and Puspitasari, W., 2020, Simultaneous Adsorption of Zn(II) and Hg(II) Ions on Selective Adsorbent of Dithizone-Immobilized Bentonite in the Presence of Mg(II) Ion, *J. Environ. Chem. Eng.*, 8 (4), 104002.
- Mudasir, M., Karelius, K., Aprilita, N.H., and Wahyuni, E.T., 2016, Adsorption of Mercury (II) on Dithizone-immobilized Natural Zeolite, *J. Environ. Chem. Eng.*, 4, 1839–1849.
- Mudasir, M. and Siswanta, D., 2007, Adsorption Characteristics of Pb(II) and Cd(II) Ions on Dithizon-loaded Natural Zeolite, *J. Ion Exchange*, 18(4), 418-423.
- de Oca-Palma, R.M., Solache-Ríos, M., Jiménez-Reyes, M., García-Sánchez, J. J., and Almazán-Sánchez, P. T., 2021, Adsorption of Cobalt by Using Inorganic Components of Sediment Samples from Water Bodies, *Int. J. Sediment Res.*, 36(4), 524–531.
- Park, S.M., Jang, J.G., Lee, N.K., and Lee, H.K., 2016, Cement and Concrete Research Physicochemical Properties of Binder Gel in Alkali-Activated Fly Ash/Slag Exposed to High Temperatures, *Cem. Concr. Res.*, 89, 72–79.
- Pearson, R.G., 1963, Hard and Soft Bases, *J. Am. Chem. Soc.*, 85(22), 3533-3539.
- Pongkitdachoti, U. and Unob, F., 2018, Simultaneous Adsorption of Silver Nanoparticles and Silver Ions on Large Pore Mesoporous Silica, *J. Environ. Chem. Eng.*, 6 (1), 596-603.
- Pratama, W.M., 2018, Limbah *Slag* Nikel Terimobilisasi Dithizon sebagai Adsorben Ion Logam Pb(II) dan Zn(II), *Tesis*, Universitas Gadjah Mada, Yogyakarta.
- Puigdomenech, I., 2010, MEDUSA: Make Equilibrium Diagrams Using Sophisticated Algorithms version 2, Royal Institute of Technology. Inorganic Chemistry, Stockholm, Sweden



- Raharjo, G., Tahir, I., and Wahyuni, E.T., 2008, Immobilization of Dithizone onto Chitin Isolated from Prawn Seawater Shells (*P. merguensis*) and Its Preliminary Study for The Adsorption of Cd(II) Ion, *J. Phys. Sci.*, 19(1),63-78.
- Repo, E., Warchol, J.K., Westholm, L.H., and Silanppa, M., 2015, Steel Slag as a Low Cost Sorbent for Metal Removal in the Presence of Chelating Agents, *J. Ind. Eng. Chem.*, 27, 115–125.
- Rinting, L., 2011, Immobilisasi Ditizon secara Fisika pada Zeolit Alam dan Aplikasinya terhadap Adsorpsi Logam Ag(I) dan Zn(II), *Tesis*, Universitas Gadjah Mada.
- Rochyatun, E. dan Rozak, A., 2007, Pemantauan Kadar Logam Berat dalam Sedimen di Perairan Teluk Jakart, *Makara, Sains*, 11 (1), 28-36.
- Safty, S.A.E., Awual, M.R., Shenashen, M.A., and Shahat, A., 2013, Simultaneous Optical Detection and Extraction of Cobalt(II) from Lithium Ion Batteries Using Nanocollector Monoliths, *Sens. Actuators B Chem.*, 176, 1015-1025.
- Samnur, S., Husain, H., Zulfi A., dan Sujiono, H., 2016, Study on Physical-Chemical Properties of Furnace-Nickel-Slag Powder for Geopolymer Application, *J. Pend. Fisika Indo.*, 12 (2).
- Sharma, S.K., Pandey, P.K., and Sambhi, S., 2015, Removal of lead (II) from waste water on zeolite-NaX., *Biochemi. Pharm.*, 3 (4), 2604–2610.
- Shirzadi, H., and Ejhieh, A.N., 2017, An Efficient Modified Zeolite for Simultaneous Removal of Pb(II) and Hg(II) from Aqueous Solution, *J. Mol. Liq.*, 230, 221–229.
- Shukla, A., Zhang, Y.H., Dubey, P., Margrave, J.L., and Shukla, S.S., 2002, The Role of Sawdust in The Removal of Unwantedmaterials from Water, *J. Hazard. Mater.*, 95, 137–152.
- Slamet, J.S., 1996, *Kesehatan Lingkungan*, Gajah Mada University Press.
- Syakirin, M., Mohd, F., and Nurjaliah, S., 2015, Adsorption of Manganese in Aqueous Solution by Steel Slag, *Procedia Environ. Sci.*, 30, 145–150.
- Wasukan, N., Srisung, S., Kuno, M., Kulthong, K., and Maniratanachote, R., 2015, Interaction Evaluation of Silver and Dithizone Complexes Using DFT



Calculations and NMR Analysis, *Spectrochim. Acta A Mol. Biomol. Spectrosc.*, 149, 830-838.

White, W.E., 1925, Dithizone as an Analytical Reagent, *J.Chem. Ed.*, 2, 269-273.

Wu, Q., Wu, Y., Tong, W., and Ma, H., 2018, Utilization of Nickel Slag as Raw Material in the Production of Portland Cement for Road Construction, *Constr. Build. Mater.*, 193, 426-434.

Xiaoming, L., Miao, S., and Chong, W., 2017, Current Situation and Development of Comprehensive Utilization of Nickel Slag, *Mater. Rev.*, 31 (3), 100-105.

Yahya, M., 2013, Pemanfaatan Limbah Industri Baja (*Blast Furnace Iron Slag*) sebagai Bahan Bangunan Studi Kasus: PT. Barawaja Makassar. *Prosiding Temu Ilmiah IPLBI*, 12 November 2013, Makassar.

Yan, L., Xiao, Z., and Mei, Q.C., 2010, Environmental Hidden Threat Characteristic and Potential Environment Hazards of Metallurgy and Mining Industry, *Modern Mining*, 26 (8), 15-18.

Zhang, L., Wei, J., Zhao, X., Li, F., Jiang, F., Zhang, M., and Cheng, X., 2016, Competitive Adsorption of Strontium and Cobalt onto Tin Antimonate, *J. Chem. Eng.*, 285, 679-689.

Zhang, S., Guo, Z., Xu, J., Niu, H., and Chen, Z., 2011, Effect of Environmental Conditions on the Sorption of Radiocobalt from Aqueous Solution to Treated Eggshell as Biosorbent, *J. Radioanal. Nucl. Chem.*, 288 (1), 121-130.

Zhou, Y. and Haynes, R.J., 2010, Sorption of Heavy Metals by Inorganic and Organic Components of Solid Wastes: Significance to Use of Wastes as Lowcost Adsorbents and Immobilizing Agents, *Critical Reviews in Environ. Sci. Tec.*, 40(11), 909-977.