

DAFTAR PUSTAKA

- Abboud, M., Youssef, S., Podlecki, J., Habchi, R., Germanos, G., and Foucaran, A., 2015, Superparamagnetic Fe_3O_4 nanoparticles, synthesis and surface modification, *Mater. Sci. Semicond. Process.*, 39 (2), 641–648.
- Adamson, A.W., 1990, *Physical Chemistry of Surface*, John Wiley & Sons. Inc., California.
- AEI-Reash, Y.G., Otto, M., Kenawy, I.M., and Ouf, A.M., 2011, Adsorption of $\text{Cr}(\text{VI})$ and $\text{As}(\text{V})$ ions by modified magnetic chitosan chelating resin, *Int. J. Biol. Macromol.*, 49 (5), 513–522.
- Al-Manhel, A.J., Al-Hilphy, A.R.S., and Niamah, A.K., 2018, Extraction of chitosan, characterisation and its use for water purification, *Journal of the Saudi Society of Agricultural Sciences*, 17(2), 186-190.
- Andreani, A., Kunarti, E., and Santosa, S., 2019, Synthesis of Gold Nanoparticles Capped-Benzoic Acid Derivative Compounds (o-, m-, and p-Hydroxybenzoic Acid). *Indones. J. Chem.*, 19 (2), 376-385.
- Apblett, A.W., Al-Fadul, S.M., and Trad, T., 2001, Removal of petrochemicals from water using magnetic filtration, *The 8th International Petroleum Environmental Conference*, November 6-9, 2001, Houston, TX.
- Atkins, Harold N., 1997, *Highway Materials, Soils, and Concretes Third Edition*. Prentice Hall, New Jersey.
- Atkins, P.W., 1997, *Kimia Fisika* (Alih Bahasa: dra. Irma I.K), Erlangga, Jakarta.
- Anonim, 1990. Toxicological profile for creosote. Agency for Toxic Substances and Disease.
- Bassi, R., Prasher S.O., Simpson, B.K., 2000, Removal of selected metal ions from aqueous solutions using chitosan flakes, *Sep Sci Technol*, 35 (4), 547–560.
- Beppu, M.M., Arruda, E.J., and Santana, C.C., 1999, Síntese e caracterização de estruturas densas e porosas de quitosana, *Polímeros: Ciência e Tecnologia*, 4(1), 163–169.
- Bragg, W., 1915, The Structure of Magnetite and the Spinels, *Nature*, 95, 561.
- Buhani, Narsito, Nuryono, and Kunarti, Eko., 2009, Amino And Mercapto-Silica Hybrid For $\text{Cd}(\text{II})$ Adsorption In Aqueous Solution. *Indones. J. Chem.*, 9 (1), 170-176.

- Buzea, C., Pacheco, II., and Robbi, K., 2007, Nanomaterials and nanoparticles: sources and toxicity. *Biointerphases*, 2 (4), 17-71.
- Cabrera, L., Gutierrez, S., Menendez, N., Morales, M.P., and Herrasti, P., 2008, Magnetite nanoparticles: electrochemical synthesis. and characterization, *Electrochim. Acta*, 5 (3), 3436–3441.
- Chae, H.S., Kim, S.D., Piao, S.H., and Choi, H.J., 2016, Core-shell structured $\text{Fe}_3\text{O}_4@\text{SiO}_2$ nanoparticles fabricated by sol-gel method and their magnetorheology, *Colloid Polym. Sci.*, 294 (1), 647–655.
- Chin, A.B., and Yaacob, I.I., 2007, Synthesis and Characterization of Magnetic Iron Oxide, *Journal of Materials Processing Technology*, 19 (1), 235-237.
- Clark, G.L., and Smith, 1936, A.F. X-ray diffraction studies of chitin, chitosan, and derivatives. *J. Phys. Chem.*, 40, Compounds, 7-9 (2), 863–879.
- Cornell, R. M., and Schwertmann, U., 2003, *The Iron Oxides: Structure, Properties, Reactions, Occurrences and Uses*, Second Edition, Wiley-VCH, Weinheim.
- Das, A., Singh, J., and Yogalakshmi, K.N., 2017, Laccase immobilized magnetic iron nanoparticles: fabrication and its performance evaluation in chlorpyrifos degradation, *International Biodeterioration & Biodegradation*, 11 (7), 183-189.
- Dash, M., Chiellini, F., Ottenbrite, R.M., and Chiellini, E., 2011, Chitosan: a versatile semisynthetic polymer in biomedical applications, *Prog. Polym. Sci.*, 3 (6), 981–1014.
- Day, R.A., and Underwood, A.L., 2002, *Analisis Kimia Kuantitatif Edisi Keenam*,. Erlangga, Jakarta.
- Deng, Yong-Hui, Chang-Chun Wang, Jian-Hua Hu, Wu-Li Yang, and Shou-Kuan Fu, 2005, Investigation of Formation of Silica-Coated Magnetite Nanoparticles via Sol–gel Approach, *Colloids and Surfaces A: Physicochemical and Engineering Aspects*, 262 (1–3), 87–93.
- Drake, P.L., and Hazelwood, K.J., 2005, Exposure-related health effects of silver and silver compounds: a review. *Ann Occup Hyg*. 7 (1), 575-585.
- Fajaroh, F., Heru, S., Sugeng, W., R. Enggawati, I.G. Wardhani, Ratih Y.U., and Kartikasari, 2010, Stabilisasi Nanopartikel Magnetite Hasil Sintesis Dengan Metode Elektrokimia Melalui Pelapisan Silika Secara In-Situ, Seminar Rekayasa Kimia Dan Proses, 1411-4216.

- Fan, L., Luo, C., Lv, Z., Lu, F., and 2011, Qiu, H., Removal of Ag^+ from water environment using a novel magnetic thiourea-chitosan imprinted Ag^+ , *Journal of Hazardous Materials*, 194 (1), 193-201
- Favela-Camacho, S.E., Samaniego-Benítez, E.J., Godínez-García, A., Avilés-Arellano, L.M., and Pérez-Robles, J.F., 2019, How to decrease the agglomeration of magnetite nanoparticles and increase their stability using surface properties, *Colloids Surfaces A Physicochem. Eng. Asp.*, 574 (1), 29–35.
- Fernanda, D.D., Rupiasih Ni Nyoman., Wendri Nyoman., and Sandriani, E.Ni Wayan., 2019, Chitosan as A Silver (Ag) Adsorbent on Hospital Photography Fixer Waste. *Buletin Fisika*, 20 (1), 6-10.
- Gibbs, G., Tobin, J.M., and Guibal, E., 2003, Sorption of Acid Green 25 on chitosan: Influence of experimental parameters on uptake kinetics and sorption isotherms, *J. Appl. Polym. Sci.*, 90 (1), 1073-1080.
- Gupta, M.K., Singh, A.K., and Srivastava, R.K., 2009, Kinetic Sorption Studies of Heavy Metal Contamination on Indian Expansive Soil, *E-Journal of Chemistry*, 6 (4), 1125-1132.
- Han, W.J., Piao, S.H., Choi, H.J., and Seo, Y., 2017, Core-Shell Structured mesoporous magnetic nanoparticles and their magnetorheological response, *Colloids Surf. A*, 524 (1), 79–86.
- Hastuti, Sri., Nuryono, and Kuncaka, Agus., 2015, L-ARGININE-MODIFIED SILICA FOR ADSORPTION OF GOLD(III), *Indones. j.chem.*, 15 (2), 108-115.
- Iakovleva, E., and Sillanpää, M., 2013, The Use of Low Cost Adsorbents for Wastewater Purification in Mining Industries, *Environmental Science and Pollution Researc.*, 20 (11), 7878-7899.
- Anonim, 2020, Available online: <http://goldbook.iupac.org/C01012.html> (akses 4 juli 2020)
- Jakabský, Š & Lovas, Michal & Mockovčíaková, Annamária & Hredzák, Slavomír, 2000, Utilization of Ferromagnetic Fluids in Mineral Processing and Water Treatment. *Journal of Radioanalytical and Nuclear Chemistry - J Radioanal Nucl Chem.*, 246 (1), 543-547.
- Jal, P.K., Patel S., and Mishra, B.K., 2004, Chemical Modification of Silica Surface by Immobilization of Functional Group for Extractive Concentrations of Metal Ions, *Talanta*, 62 (5), 1005-1028.

- Jal, P.K., Sudarshan, M., Saha, Patel, S., and Mishra, B.K., 2004, Synthesis and Characterization of Nanosilica Prepared by Precipitation Method, *Colloids and Surfaces.*, 240 (2-5), 173-178
- Karimi Pasandideh, E., Kakavandi, B., Nasser, S., Mahvi, A. H., Nabizadeh, R., Esrafil, A., Rezaei Kalantary, R., 2016, Silica-coated magnetite nanoparticles core-shell spheres ($\text{Fe}_3\text{O}_4@\text{SiO}_2$) for natural organic matter removal, *Journal of environmental health science & engineering.*, 14, 21.
- Karimnezhad, K., and Moghimi, A., 2014, Extraction of $\text{Zn}(\text{II})$ Using Magnetic Chitosan Nanoparticles Grafted With β -cyclodextrin and Determination by Faas, *Orient. J. Chem*, 30 (1), 95–103.
- Knorr. D., 1983, Dye binding properties of chitin and chitosan, *J Food Sci.*, 48 (7), 36–41.
- Kurnaz Yetim, N., Kurşun Baysak, F., and Koç, M.M., 2020, Characterization of magnetic $\text{Fe}_3\text{O}_4@\text{SiO}_2$ nanoparticles with fluorescent properties for potential multipurpose imaging and theranostic applications. *J Mater Sci: Mater Electron.*, 31, 18278–18288.
- Laurent, S., Forge, D., Port, M., Roch A., Robic, C., Vander Elst, L., and Muller R.N., 2008, Magnetic iron oxide nanoparticles: synthesis, stabilization, vectorization, physicochemical characterizations, and biological applications, *Chem Rev.*, 108 (6), 2064-110.
- Liu, J., Chen, Y., Han, T., Cheng, M., Zhang, W., Long, J., and Fu, X., 2019, A biomimetic SiO_2 @chitosan composite as highly-efficient adsorbent for removing heavy metal ions in drinking water, *Chemosphere.*, 214, 738–742.
- Lu, A., Salabas E.L., and Schuth F., 2007, Magnetic Nanoparticles: synthesis, protection, functionalization, and application. *Angew, Chem. Int.*, 46, 1222-1244.
- Maghami, G.G., and Roberts, G.A.F., 1988, Studies on the adsorption of anionic dyes on chitosan magnetite reduction for lithium-ion batteries. *Journal of Alloys and Makromol. Chem.*, 189, 2239-2243.
- Mascolo, M. C., Yongbing Pei, and Ring, T.A., 2013. Room Temperature Co-Precipitation Synthesis of Magnetite Nanoparticles in a Large pH Window with Different Bases, *Materials.*, 6, 5549-5567.
- McMurry, J., 2008, *Organic Chemistry*, 7th Edition, Thomson Brooks Cole.

- Mittal, A., Ahmad, R., and Hasan, I., 2016, Iron oxide-impregnated dextrin nanocomposite: synthesis and its application, *Desalination and Water Treatment.*, 67 (32), 15133-15145.
- Monier, M., 2012, Adsorption of Hg^{2+} , Cu^{2+} and Zn^{2+} ions from aqueous solution using formaldehyde cross-linked modified chitosan–thioglyceraldehyde Schiff's base, *Int. J. Biol. Macromol.*, 50, 773–781.
- Monier, M., and Abdel-Latif, D.A., 2012, Preparation of cross-linked magnetic chitosan- phenylthiourea resin for adsorption of Hg (II), Cd (II) and Zn (II) ions from aqueous solutions, *J. Hazard. Mater.*, 209, 240–249.
- Muflikhah, Nuryono, and Rusdiarso, 2016, Modifikasi Silika Terlapis Pada Bahan Magnetik Pasir Besi Dengan Kitosan Melalui Penghubung 3-Glisidoksisipropil Trimetoksisilan Untuk Adsorpsi $[\text{AuCl}_4]^-$, Thesis, Departemen Kimia, Universitas Gadjah Mada, Yogyakarta.
- Musa, S., Roto., and Kuncaka, A., 2020, Sintesis nanopartikel $\text{Fe}_3\text{O}_4/\text{SiO}_2$ termodifikasi asam glutamat (AG) sebagai adsorben ion Ag^+ , Thesis, Departemen Kimia, Universitas Gadjah Mada, Yogyakarta.
- Muzzarelli, R.A.A., 1973, *Natural Chelating Polymers: Alginic Acid, Chitin, and Chitosan*, 55, Pergamon Press, Oxford, UK.
- Muzzarelli, R.A.A., and Tubertini, O., 1969, Chitin and chitosan as chromatographic supports and adsorbents for collection of metal ions from organic and aqueous solutions and sea-water. *Talanta.*, 16, 1571–1577.
- Navarro, Ramesh, A., and Ueda, K., 2003, Adsorption of Gold (II), Palladium (II), and Platinum (IV) Onto Glycine Modified Cross-Linked Chitosan Resin, *Bioresour. Tech.*, 99 (9), 3802-3810.
- Nechifor, A.C., Rikabi, A.A.K.B., Clej D.D., Szidonia-katani, T., Trisca-rusu, C., and Orbeci, C., 2015, Synthesis of Fe_3O_4 - TiO_2 composite nanoparticles for ampicillin and penicillin G photo-degradation, *Revista Romana de Materiale/ Romanian Journal of Materials*, 45, 80-90.
- Nigam, S., Barick, K.C., and Bahadur, D., 2011, Development of citrate-stabilized Fe_3O_4 nanoparticles: Conjugation and release of doxorubicin for therapeutic applications, *J. Magn. Magn. Mater.*, 323, 237–243.
- No., H.K., Meyers, S.P., Prinyawiwatkul, W., and Xu Z., 2007, Applications of chitosan for improvement of quality and shelf life of foods: a review. *J Food Sci.*, 72 (5), 87-100.

- Okoronkwo, A.E., Owolabi, B.J., Ayodele, O., 2014, Biosorption of nickel and copper from a mixed metals solution using chitosan derived from crabs. *Current Journal of Applied Science and Technology*. 4 (26), 3769–3784.
- Petcharoen, K., and Sirivat, A., 2012, Synthesis and characterization of magnetite nanoparticles via the chemical co-precipitation method, *Materials Science and Engineering: B*, 177 (5), 421-427.
- Ren, Y., Abbood, H.A., He, F., Peng., and Huang, K., 2013, Magnetic EDTA-modified chitosan/ $\text{SiO}_2/\text{Fe}_3\text{O}_4$ adsorbent: Preparation, characterization, and application in heavy metal adsorption, *Chemical Engineering Journal*., 226, 300-311.
- Repo, E., 2011, *EDTA- and DTPA- Functionalized Silica Gel and Chitosan Adsorbents for the Removal of Heavy Metals From Aqueous Solutions*, Thesis, Lappeenranta University of Technology.
- Rinaudo, M., 2006, Chitin and chitosan: Properties and applications. *Prog. Polym. Sci.*, 31, 603–632.
- Robert, G.A., 1992, *Chitin Chemistry*., Nottingham Polytechnic, McMillan, USA.
- Roto, 2018, *Surface Modification of Fe_3O_4 as Magnetic Adsorbents for Recovery of Precious Metals*, Advanced Surface Engineering Research, IntechOpen.
- Ruthven, D.M., 1984, *Principle of adsorption and Adsorption Process*, John Wiley dan Sons: New York.
- Sawitri, E., Azmiyawati, C., Siahaan P., and Darmawan, A., 2018, Synthesis Of Adsorbent Magnetite Silica Functionalized Cetyltrimethylammonium Bromide (CTAB) From Iron Sand Klayar Beach Pacitan. *Jurnal Sains Dasar*, 7 (1), 29-34.
- Seo, Y.P., Han, S., Choi, J., Takahara, A., Choi, H.J., and Seo, Y., 2018, Searching for a stable High- Performance magnetorheological suspension, *Adv. Mater*, 30 (1-13), 170476.
- Sharma, Y., 2013, *A Guide to the Economic Removal of Metals from Aqueous Solutions*. Wiley, Scrivener., 31-43.
- Sheykhan, M., Yahyazadeh, A., and Rahemizadeh, Z., 2016, Cu–EDTA-modified APTMS- $\text{Fe}_3\text{O}_4@\text{SiO}_2$ core–shell nanocatalyst: a novel magnetic recoverable catalyst for the Biginelli reaction. *RSC Advances*., 6, 34553-34563.

- Song C., 2017, Carbon coated mesoporous Si anode prepared by a partial, *Chem, apl.*, 4, 20.
- Stum, W., and Morgan, J.J., 1996, *Aquatic Chemistry: Chemical Equilibria and Rates in Natural Waters*, John Wiley and Sons Inc., Canada.
- Stum, W., and Morgan, J.J., 1996, *Aquatic Chemistry: Chemical Equilibria in Natural Water*, John Willey and Sons. Inc., New York.
- Sun, X., Yang, L., Dong, T., Liu, Z., and Liu, H., 2016, Removal of Cr(VI) from aqueous solution using amino-modified Fe_3O_4 - SiO_2 -chitosan magnetic microspheres with high acid resistance and adsorption capacity. *J. Appl. Polym. Sci.*, 133, 43078.
- Susanti, A. D., Sediawan, W. B., Wirawan, S. K., and Budhijanto, 2017, *Model Isoterm Keseimbangan Adsorpsi Oryzanol dalam Minyak Bekatul pada Adsorben Silika Gel dengan Fase Gerak n-Heksana:Aseton*, Skripsi, Program Sarjana Fakultas Teknik, Universitas Gadjah Mada, Yogyakarta.
- Tan, K.H., 1992, *Principles of Soil Chemistry*, John Wiley & Sons, New York.
- Teja, A.S. and Koh, P.-Y., 2009, Synthesis, Properties, and Applications of Magnetic Iron Oxide Nanoparticles. *Progress in Crystal Growth and Characterization of Materials.*, 55, 22-45.
- Teja, A.S., P.-Y., and Koh, 2007, Progress in Crystal Growth Characterization of Materials, *Critical Reviews in Solid State and Material Sciences*, 32, 3-4.
- Vaclavikova, M. & Gallios, Georgios & Hredzák, Slavomír & Jakabsky, Stefan. 2008, Removal of arsenic from water streams: An overview of available techniques. *Clean Technologies and Environmental Policy.*, 10, 89-95.
- Varadan, V.K., Chen, L., and Xie, J., 2008, *Nanomedicine: Design and Applications of Magnetic Nanomaterials, Nanosensors and Nanosystems*, Wiley, India.
- Vieira, R.S., and Beppu, M.M., 2005, Mercury ion recovery using natural and crosslinked chitosan membranes, Adsorption, *J. Int. Ads. Soc.*, 11, 731.
- Wang, Y.M., Liu, S.W., Xiu, Z., Jiao, X. B., Cui, X. P., and Pan, J., 2006, Preparation and photocatalytic properties of silica gel-supported TiO_2 . *Materials Letters.*, 60, 974-978.
- Willis, T., 2009, *Sorbents – Properties, Materials and Applications*, Nova Science Publishers Inc., New York, 52-104.

- Wolkersdorfer, C., 2013, *From Ground Water to Mine Water. Workshop on Mine Water Management and Remediation*, Lappeenranta University of Technology, Conference, Finland, Mikkeli.
- Wu, D., Hu, L., Wang, Y., Wei, Q., Yan, L., Yan, T., Li, Y., and Dua, B., 2018, EDTA modified β -cyclodextrin/chitosan for rapid removal of $\text{Pb}(\text{II})$ and acid red from aqueous solution, *J Colloid Interface Sci.*, 1 (523), 56-64.
- Wu, Li., Haochen Zhou, Juan Yang, Xiangyang Zhou, Yongpeng Ren, Yang Nie, Wu, W., He, Q., and Jiang, C., 2008, Magnetic iron oxide nanoparticles: synthesis and surface functionalization strategies, *Nanoscale Res. Lett.*, 3, 397-415.
- Xu, Z., Shen, C., Hou, Y., Gao, H., and Sun, S., 2009, Oleylamine as Both Reducing Agent and Stabilizer in a Facile Synthesis of Magnetite Nanoparticles. *Chem. Mater.*, 21, 1778–1780.
- Yamaura, Mitiko Camilo, R.L., Sampaio, L.C., Macedo, M.A., Nakamura, Marcelo Toma, and Henrique, 2004, Preparation and Characterization of (3-Aminopropyl)triethoxysilane-Coated Magnetite Nanoparticles, *Journal of Magnetism and Magnetic Material.s*, 279, 210-217.
- Yoshida, H., Okamoto, A., and Kataoka, T., 1993, Adsorption of Acid Dye on Cross-Linked Chitosan Fibers Equilibria, *Chemical Engineering Science*, 48, 2267-2272.
- Younes, I., and Rinaudo M., 2015, Chitin and chitosan preparation from marine sources. Structure, properties and applications. *Mar Drug.*, 213 (3), 1133-1174.
- Yuan, Ma L., Ding, K., Wang, M., Wu, S., Li, X., Ma, Y., Zhou, K., Li X., Fei, 2011, Preparation of estriol–molecularly imprinted silica nanoparticles for determining oestrogens in milk tablets, *Food Chemistry*, 131, 1063–1068.
- Zhang, C.P., Deng, W., Hu, Z.C., Luo, Y.P., Gao, X., and Hu, L., 2000, Preparation of ultrafine Fe particles by microemulsion method, *Chinese Journal of Applied. Chemistry*, 17 (3), 248-251.
- Zhang, X., Wang, H., and He, L., 2013, Using biochar for remediation of soils contaminated with heavy metals and organic pollutants. *Environ Sci Pollut Res*, 20, 8472–8483.
- Zhoua, L., Wang, J., Liu, Z., and Huang, Q., 2009, Characteristics of equilibrium, kinetics studies for adsorption of $\text{Hg}(\text{II})$ $\text{Cu}(\text{II})$, and $\text{Ni}(\text{II})$ ions by thiourea-modified magnetic chitosan microspheres, *J. Hazard. Mater.*, 161, 995–1002.