



DAFTAR PUSTAKA

- Abdeen, Z., Mohammad, S.G. dan Mahmoud, M.S., 2015, Adsorption of Mn (II) Ion on Polyvinyl Alcohol/Chitosan Dry Blending from Aqueous Solution, *Environ. Nanotech.*, 3, 1-9.
- Abdel-Ghani, N.T. dan El-Chaghaby, G.A., 2014, Biosorption for Metal Ions Removal from Aqueous Solutions: A Review of Recent Studies, *Int. J. Latest. Res. Sci. Technol.*, 3(1), 24-42.
- Andrade, A.L., Souza, D.M., Pereira, M.C., Fabris, J.D. dan Domingues, R.Z., 2009, Synthesis and Characterization of Magnetic Nanoparticles Coated with Silica Through Sol Gel Approach, *J. Cer.*, 55, 420-424.
- Baba, Y., Hirakawa, H. Dan Yoshizuka, 1994, Adsorption Equilibria of Silver(I) and Copper(II) Ions on N-(2-Hydroxylbenzyl)chitosan Derivative, *Anal. Sci.*, 10, 601-605.
- Basuki, B.R. dan Sanjaya, I.G.M., 2009, Sintesis Ikat Silang Kitosan dengan Glutaraldehid serta Identifikasi Gugus Fungsi dan Derajat Deasetilasinya, *J. Ilmu Dasar.*, 10(1), 93-101.
- Benavente, M., 2008, Adsorption of Metallic ions onto Chitosan: Equilibrium and Kinetic Studies, *Thesis*, Department of Chemical Engineering and Technology, Division of Transport Phenomena, Royal Institute of Technology, Stockholm, Sweden.
- Brendler, V., 1999, Physico-Chemical Phenomena Governing the Behaviour of Radioactive Substances, Site-specific characteristic, *Restoration Strategies for Radioactively Contaminated Sites and their Close Surroundings RESTRAT-WPZ*, Project F14P-CT95 – 0021a (PL950128), Co-funded by Nuclear Fission Safety Program of European Commission, Dresden.
- Brown, M. dan Navrotsy, F., 1994, Hematite-ilmenite (FeTiO_3) Solid Solutions: The Effects of Cation Ordering on the Thermodynamics of Mixing, *J. Mater.*, 7, 485-496.
- Bruce, I.J., Taylor, J., Todd, M., Davies, M.J., Borioni, E., Sangregorio, C. dan Sen, T., 2004, Synthesis, Characterisation and Application of SilicaMagnetite Nanocomposites, *J. Magn. Magn. Mater.*, 284(1–3), 145–160.



Bruni, S., Cariati, F., Casu, M., Lai, A., Musinu, A., Piccaluga, G. dan Solinas, S., 1999, *Nanostruct. Mater.*, 11, 573-586.

Budnyak, T.M., Pylypczuk, I.V., Tertykh, V.A., Yanovska, E.S. dan Kolodynska, D., 2015, Synthesis and Adsorption Properties of Chitosan-Silica Nanocomposites Prepared by Sol-Gel Method, *Nanoscale. Res. Lett.*, 10(87), 1-10.

Buhani dan Suharso, 2010, Modifikasi Silika dengan 3-Aminopropil trimetoksisilan Melalui Proses Sol Gel untuk Adsorpsi Ion Cd(II) dari Larutan, *J. Sains. MIPA.*, 16, 177-183.

Capelo-Martinez, J.L., 2009, *Ultrasound in Chemistry: Analytical Applications*, WILEY-VCH Verlag GmbH & Co. KgaA, Weinheim.

Champagne, L.M., 2008, The Synthesis of Water Soluble N-Acyl Chitosan Derivatives for Characterization as Antibacterial Agents, *Disertasi*, Departement of Chemistry, Louisiana State University.

Chao, A.C., 2008, Preparation of Porous Chitosan/GPTMS Hybrid Membrane and Its Application in Affinity Sorption for Tyrosinase Purification with *Agaricusbisporus*, *J. Membrane. Sci.*, 311(1-2), 306–318.

Cheremenisoff, O.N., 1987, *Carbon Adsorption Hand Book*, Science Publisher Inc, Michigan, USA.

Crossgrove, J. dan Zheng, G.W, 2004, Manganese Toxicity upon Overexposure, *NMR. Biomed.*, 17, 544-553.

Dabrowski, A., 2001, Adsorption-from Theory to Practice, *Adv. Colloid Interface Sci.*, 93, 135-224

Deng Y.H., Wang, C.C., Hu, J.H., Yang, W.L. dan Fu, S.K., 2005, Investigation of Formation of Silica-Coated Magnetite Nanoparticles via Sol-Gel Approach, *Colloids and Surfaces A: Physicochem, Eng. Aspects.*, 262, 87-93.

Dhawade, P. dan Jagtap, R., 2012, Comparative Study of Physical and Thermal Properties of Chitosan-Silica Hybrid Coatings Prepared by Sol Gel Method, *J. Der. Chemica. Sinica.*, 3(3), 589-601.

Drbohlavova, J., Hrdy, R., Adam, V., Kizek, R., Schneeweiss, O. dan Hubalek, J., 2009, Preparation and Properties of Various Magnetic Nanoparticles, *J. Chem. Mater.*, 9, 2352-2362.



Eliot, H.A., Liberati, M.R. dan Huang, C.P., 1986, Competitive Adsorption of Heavy Metals by Soils, *J. Environ. Qual.*, 15(3), 214-219.

Gasser, J.K.R., 1985, Processes Causing Loss of Calcium from Agricultural Soils, *Soil. Use. Manage.*, 1(1), 14-17.

Ghaee, A., Niassar, M.S., Barzin, J. dan Zarghan, A., 2012, Adsorption of Copper and Nickel Ions On Macroporous Chitosan Membrane: Equilibrium Study, *Appl. Surf. Sci.*, 258, 7732-7743.

Guibal E., 2004, Interaction of metal ions with chitosan-based sorbents: A Review, *Sep. Purif. Technol.*, 43-74.

He, X., Xu, H. dan Li, H., 2015, Cr(VI) Removal from Aqueous Solution by Chitosan/Carboxymethyl Cellulose/Silica Hybrid Membrane, *World J. Eng. Technol.*, 3, 234–240.

Helena, Y., 2009, Analisis Mg dan Zn dalam Berbagai Varietas Apel Secara Spektrofotometri Serupa Atom Perbandingan Antara Destruksi Kering dan Destruksi Basah, *Tesis*, Departemen Kimia Fakultas MIPA UGM, Yogyakarta.

Ho, Y.S., 2004, Citation Review of Lagergren Kinetic Rate Equation on Adsorption Reactions, *Scientometrics*, 59(1), 171-177.

Ho, Y.S., 2006, Review of Second-order Models for Adsorption Systems, *J. Hazard. Mater.*, 136(3), 103-111.

Ho, Y.S. dan McKay, G., 1999, Pseudo-second Order Model for Sorption Processes, *Process. Bio. Chem.*, 34, 451-465.

Jal, P.K., Patel, dan Mishra, B.K., 2004, Chemical Modification of Silica Surface by Immobilization of Functional Groups for Extractive Concentration of Metal Ions, *Talanta*, 62, 1005-1028.

Jati, M.A.S., 2010, Sintesis dan Karakterisasi Hibrida Kitosan-Silika untuk Adsorpsi Pb(II), *Skripsi*, Departemen Kimia Fakultas MIPA UGM, Yogyakarta.

Kaban, J., 2009, *Modifikasi Kimia dari Kitosan dan Aplikasi Produk yang Dihasilkan*, Universitas Sumatera Utara, Medan.



Kan, C., Aganon, M., Futalan, C. dan Dalida, M., 2013, Adsorption of Mn²⁺ from Aqueous Solution using Fe and Mn Oxide-coated Sand, *J. Environ. Sci.*, 25(7), 1438-1491.

Karimnezhad, K. dan Moghimi, A., 2014, Extraction of Zn(II) Using Magnetic Chitosan Nanoparticles Grafted with Cyclodextrin and Determination By FAAS, *Orient. J. Chem.*, 30(1), 95–103.

Kartohadiprojo, I.I., 1999, *Kimia Fisika Jilid 1*, edisi keempat (diterjemahkan dari Atkins, P.W., 1990, *Physical Chemistry*, Oxford University Press, Oxford), Erlangga, Jakarta.

Kestelman, V.N. dan Pomogailo, A.D., 2005, *Metallopolymer Nanocomposites*, Springer-Verlag Berlin Heidelberg, Heidelberg.

Kusuma, R.C., Budianta, W. dan Arifudin, 2017, Kajian Kandungan Logam Berat di Lokasi Penambangan Emas Tradisional di Desa Sangon, Kecamatan Kokap, Kabupaten Kulon Progo, *Prosiding Seminar Nasional XII 'Rekayasa Teknologi Industri dan Informasi'*, STTN Yogyakarta, 323-327.

Kopecky F., Kopecka B. dan Misikova E., 2005, Sorption of Copper(II) on Chitosan from Solution of Copper Sulphate, Copper Perchlorate and Copper Nitrate, *Tomus LII, Acta Facultatis Pharmaceuticae Universitatis Comenianae*, 154-134.

Lakay, E.M., 2009, Superparamagnetic Iron-Oxide Based Nanoparticles for The Separation and Recovery of Precious Metals from Solution, *Thesis*, University of Stellenbosch.

Lesbani, A., Turnip, E.V., Mohadi, R. dan Hidayati, N., 2015, Study Adsorption Desorption of Manganese(II) Impregnated Chitin-Cellulose as Adsorbent, *Internat. J. Sci. Eng.*, 8(2), 104-108.

Lessi, P., Filho, N.L.D., Moreira, J.C. dan Campos, J.T.S., 1996, Sorption and Preconcentration of Metal Ions on Silica Gel Modified with 2,5-dimercapto-1,3,4-thiadiazole, *Anal. Chim. Acta*, 372, 183-190.

Lim, C.W. dan Lee, I.S., 2010, Review: Magnetically Recyclable Nanocatalyst Systems for the Organic Reactions, *Nanotoday.*, 5, 412-434.

Liu, Y.L., Su, Y.H. dan Lai, J.Y., 2004, In Situ Crosslinking of Chitosan and Formation of Chitosan-Silica Hybrid Membranes with Using



Glycidoxypipropyl trimethoxysilane as a Crosslinking Agent, *Polymer*, 45(20), 6831–6837.

Mahendra, J., 2007, Pemanfaatan Kitosan dan Kitosan Termodifikasi dari Limbah Udang sebagai Adsorben Cu, Cr dan Zn, *Skripsi*, Universitas Indonesia, Depok.

Martel, A.E. dan Hancock, R.D., 1996, *Metal Complexes in Aqueous Solutions*, Plenum Perss, New York.

McBride, M.B., 1994, *Environmental Chemistry of Soil*, 1st Edition, Oxford University Press, 416.

Mengel, K. dan Kirkby, E.A., 1982, *Principles of Plant Nutrition*, 3rd ed, International Potash Institute, Switzerland, 402-408.

Mohadi, R., Saputra A., Hidayati, N. dan Lesbani A., 2014, Studi Interaksi Ion Logam Mn²⁺ dengan Selulosa dari Serbuk Kayu, *Jurnal Kimia*, 8(1), 1-8.

Monteiro, O.A.C. dan Airoldi, C., 1999, Some Thermodynamic Data on Copper-Chitin and Copper-Chitosan Biopolymer Interactions, *J. Colloid Interface Sci.*, 212, 212-219.

Muflikhah, 2016, Modifikasi Silika Terlapis pada Bahan Magnetik Pasir Besi dengan Kitosan melalui Penghubung 3-Glisidoksipropil Trimetoksisilan untuk Adsorpsi [AuCl₄]⁻, *Tesis*, Departemen Kimia Fakultas MIPA UGM, Yogyakarta.

Navarro, R., Guzman, J., Saucedo, I., Revilla, J. dan Guibal, E., 2003, Recovery of Metal Ions by Chitosan: Sorption Mechanisms and Influence of Metal Speciation, *Macromol. Biosci.*, 3, 552-561.

Ngah, W.S.W., Teong, L.C. dan Hanafiah, M.A.K.M., 2011, Adsorption of Dyes and Heavy Metal Ions by Chitosan Composites: A Review, *Carbohydr. Polym.*, 83, 1446–1456.

Nomanbhay, S.M. dan Palanisamy, K., 2005, Removal of Heavy Metal from Industrial Waste Water using Chitosan Coated Oil Palm Shell Charcoal, *Electron. J. Biotechnol.*, 8(1), 43-52.

Nugroho, A., Nurhayati, N.D. dan Utami, B., 2011, Sintesis dan Karakterisasi Membran Kitosan untuk Aplikasi Sensor Deteksi Logam Berat, *Molekul*, 6(2), 123-136.



Nuryono, N., Rosiati, N.M., Rusdiarso, B., Sakti, S.C.W. dan Tanaka, S., 2014, Coating of Magnetite with Mercapto Modified Rice Hull Ash Silica in A One-Pot Process, *SpringerPlus*, 3, 515, 1-12.

Oliveira, B.F., Santana, M.H.A. dan Re, M.I., 2005, Spray-Dried Chitosan Microspheres Cross-linked with D,L-Glyceraldehyde as a Potential Drug Delivery System: Preparation and Characterization, *Braz. J. Chem. Eng.*, 22(3), 353-360.

Oscik, J. dan Cooper, I.L., 1982, *Adsorption*, Ellis Horwood Ltd., Chichester.

Pandis, C., Madeira, S., Matos, J., Kyritsis, A., Mano, J.F. dan Ribelles, J.L.G., 2014, Chitosan-Silica Hybrid Porous Membranes, *Mater. Sci. Eng. C*, 42, 553–561.

Parameswary, C.S., 2016, Pelapisan Silika Termodifikasi Kitosan pada Bahan Magnetik Pasir Besi untuk Adsorpsi Emas(III), *Skripsi*, Departemen Kimia Fakultas MIPA UGM, Yogyakarta.

Pelrano, F., Flores, J.A., Rodriguez, A., Borja, N.A., Martha, L.Y. dan Maldonado, H., 2003, Adsorption of Gold(III) Ions by Chitosan Biopolymer, *Rev. Soc. Quim. Peru.*, 69(4), 211-221.

Pinta, M. dan Aubert, H., 1977, *Trace Elements in Soils*, Elsevier Scientific Publishing Company, Amsterdam.

Qiu, H., Lv, L., Pan, B.C., Zhang, Q.J., Zhang, W.M. dan Zhang, Q.X., 2009, Critical Review in Adsorption Kinetic Models, *J. Zhejiang. Univ. Sci. A.*, 10(6), 716-724.

Qu, R., Sun, C., Wang, M., Ji, C., Xu, Q., Zhang, Y., Wang, C., Chen, H. dan Yin, P., 2009, Adsorption of Au(III) from Aqueous Solution Using Cotton Fiber/Chitosan Composite Adsorbents, *Hydrometallurgy*, 100, 65-71.

Ramesh, A., Hasegawa, H., Sugimoto, W., Maki, T. dan Ueda, K., 2007, Adsorption of gold(III), platinum(IV) and palladium(II) onto glycine modified crosslinked chitosan resin, *Bioresour. Technol.*, 99, 3801-3809.

Ren, Y., Abbood, H.A., He, F., Peng, H. dan Huang, K., 2013, Magnetic EDTA Modified Chitosan/SiO₂/Fe₃O₄ Adsorbent: Preparation, Characterization, and Application in Heavy Metal Adsorption, *Chem. Eng. J.*, 226, 300-311.



Roldan, P.S., Alcântara, I.L., Padilha, C.C.F. dan Padilha, P.M., 2005, Determination of Copper, Iron, Nickel and Zinc in Gasoline by FAAS after Sorption and Preconcentration on Silica Modified with 2-Aminotiazole Groups, *Fuel.*, 84, 305-309.

Rochani, S., Pramusanto, Sariman, dan Anugrah, R.I., 2008, The Current Status of Iron Minerals in Indonesia, *Indo. Mining J.*, 11(11), 1-17.

Rouquerol, F., Rauquerol, J. dan Sing, K., 1999, *Adsorption by Powders and Porous Solids: Principles, Methodology and Applications*, Academic Press, London.

Rozana, K., 2015, Pelapisan Bahan Magnetik Pasir Besi dengan Silika Termodifikasi Etilendiamina, *Skripsi*, Departemen Kimia Fakultas MIPA UGM, Yogyakarta.

Rusianto, T., Wildan, M.W., Abraha, K. dan Kusmono, The Potential of Iron Sand from The Coast South of Bantul Yogyakarta as Raw Ceramic Magnet Materials, *J. Tekno.*, 5(1), 62-69.

Ruswanti, I., Khabibi. dan Lusiana, R.A., 2007, *Membran Kitosan Padat dari Cangkang Rajungan (Portunus pelagicus) dan Aplikasinya sebagai Adsorben Ion Mangan(II) dan Besi(II)*, Universitas Diponegoro, Semarang.

Sahoo, P.R. dan Venkatesh, A.S., 2015, Constrains of Mineralogical Characterization of Gold Ore: Implication for Genesis, Controls and Evolution of Gold from Kondarkocha Gold Deposit Eastern India, *J. Asian Earth Sci.*, 97(PA), 136-149.

Šapic, I. M., Bistraci, L., Volovšek, V. dan Danani, V., 2014, Vibrational Analysis of 3-Glycidoxypolytrimethoxysilane Polymer, *Macromol. Symp.*, 339, 122–129.

Saputro, S., Hadipranoto, N. dan Kuncaka, A., 2001, Study on The Interference of Iron, Aluminium and Silicon on The Atomic Absorption Spectrometric Determination of Mangan in Laterite Mineral, *Indo. J. Chem.*, 1(2), 98-104.

Schmul, R., Krieg, H.M. dan Keizer, K., 2001, Adsorption of Cu(II) and Cr(IV) Ions by Chitosan: Kinetics and Equilibrium Studies, *Water S.A.*, 27(1), 1-8.

Setiyono, A., 2014, Studi Kadar Mangan (Mn) pada Air Sumur Gali di Desa Karangnunggal Kecamatan Karangnunggal Kabupaten Tasikmalaya, *J. Kes. Kom. Indo.*, 10(1), 974-981



Shirosaki, Y., Tsuru, K., Hayakawa, S., Osaka, A., Lopes, M.A., Santos, J.D. dan Fernandes, M.H., 2005, In Vitro Cytocompatibility of MG63 Cells on Chitosan-Organosiloxane Hybrid Membranes, *Biomaterials*, 26(5), 485-493.

Sigh, A., Narvi, S.S., Dutta, P.K. dan Pandey, N. D., 2006, External Stimuli Response on a Novel Chitosan Hidrogel Crosslinked with Formaldehyde, *Bull. Mater. Sci.*, 29(3), 233-238.

Stum, W. dan Morgan, J.J., 1981, *Aquatic Chemistry: Chemical Equilibria in Natural Water*, John Wiley and Sons Inc., New York.

Sulastri, S., Nuryono, N., Kartini, I. dan Kunarti, E.S., 2011, Adsorption of Ca(II), Pb(II), and Ag(I) on Sulfonato-Silica Hybrid Prepared from Rice Hull Ash, *Indo. J. Chem.*, 11(3), 273-278.

Sun, X., Yang, L., Li, Q., Zhao, J., Li, X., Wang, X. Dan Liu, H., 2014, Amino Functionalized Magnetic Cellulose Nanocomposite as Adsorbent for Removal of Cr(VI): Synthesis and Adsorption Studies, *Chem. Eng. J.*, 241, 175–183.

Svehla, 1979, *Vogel: Buku Teks Analisis Anorganik Kualitatif Makro dan Semimikro*, diterjemahkan oleh Setiono dan Pudjaatmaka, PT. Kalman Media Pusaka, Jakarta.

Syukur, M., 2014, Sintesis $\text{Fe}_3\text{O}_4/\text{SiO}_2$ Termodifikasi (N-(2-aminoetil)-3-aminopropil) untuk Adsorpsi-Desorpsi Anionik (AuCl_4^-), *Tesis*, Departemen Kimia Fakultas MIPA UGM, Yogyakarta.

Terrada, K., Matsumoto, K. dan Kimura, H., 1983, Sorption of Copper(II) by Some Complexing Agents Loaded on Various Support, *Anal. Chim. Acta*, 153, 237-247.

Tian, Y., Yin. P., Qu. R., Wang. C., Zheng. H. dan Yu. Z., 2010, Removal of Transition Metal Ions from Aqueous Solutions by Adsorption Using a Novel Hybrid Material Silica Gel Chemically Modified by Triethylenetetramino Methyleneephosphonic Acid, *Chem. Eng. J.*, 162, 573-579.

US EPA., 2004, *The Incidence and Severity of Sediment Contamination in Surface Waters of United States, National Sediment Quality Survey*, Second Edition, EPA-823-R-04-2007, US Environmental Protection Agency, Washington D.C.



US Geological Survey Minerals Year Book, 2002 , *Manganese*, USA, 49, 1-16.

Utami, U.B.L., Umaningrum, D. dan Shaumi, I., 2015, Kajian Adsorpsi Mn(II) oleh Arang Kayu Apu (*Pistia stratiotes L*) Termodifikasi Kitosan-Glutaraldehida, *Prosiding Seminar Nasional Kimia*, ISBN: 978-602-0951-05-8, Jurusan Kimia Universitas Negeri Surabaya, Surabaya.

Wang, D., 2014, Sol-Gel Silica-Based Tissue Scaffolds: Freeze Casting and SIMS Analysis Strategies, *Thesis*, Department of Materials, Imperial College London, UK.

Wang, J., Fan, X., Tian, W., Wang, Y. dan Li, J., 2011, Ring-Opening Polymerization Of Glycidoxypropyltrimethoxysilane Catalyzed by Multimetal Cyanide Catalyst, *J. Polym. Res.*, 18(6), 2133–2139.

Widowati, W., Sastiono, A. dan Jusuf, R., 2008, *Efek Toksik Logam Pencegahan dan Penanggulangan Pencemaran*, Andi Press, Yogyakarta.

Wu, W., He, Q. dan Jiang, C., 2008, Magnetic Iron Oxide Nanoparticles: Synthesis and Surface Functionalization Strategies, *Nanoscale Res. Lett.*, 3(11), 397-415.

Yang, D., Hu, J. dan Fu, S., 2009, Controlled Synthesis of Magnetite-Silica Nanocomposites via a Seeded Sol-Gel Approach, *J. Phys. Chem.*, 113, 7646–7651.

Yuniarti, M., 2013, Studi Adsorpsi-Reduksi Ion $[AuCl_4]^-$ pada Magnetit Terlapis Asam Humat (Fe_3O_4/HA), *Skripsi*, Departemen Kimia Fakultas MIPA, UGM, Yogyakarta.

Zhang, X., Liu, S., Gao, Y., Zhang, Y., Re, L., Hu, R. dan Chen, R., 2013, Preparation of Amines Functionalized of Phenol with Dimethyl Carbonate, *J. Chem. Soc. Pak.*, 15(5), 1284-1287.