

DAFTAR PUSTAKA

- Abdou, E.S., Osheba, A., and Sorour, M., 2012, Effect of Chitosan and Chitosan-Nanoparticles as Active Coating on Microbiological Characteristics of Fish Fingers, *Int. J. Appl. Sci. Technol.*, 2(7), 158–169.
- Adikwu, M., and Ofokansi, K., 2007, Formulation and Evaluation of Microspheres Based on Gelatin-Mucin Admixtures for The Rectal Delivery of Cefuroxime Sodium, *Trop. J. Pharm. Res.*, 6, 825–832.
- Ahmad, A., Rafatullah, M., Sulaiman, O., Ibrahim, M.H., Chii, Y.Y., and Siddique, B.M., 2009, Removal of Cu(II) and Pb(II) Ions from Aqueous Solutions by Adsorption on Sawdust of Meranti Wood, *J. Desal.*, 247(1-3), 636–646.
- Althaf, A., Khair, U., and Praneetha, P., 2011, Preparation and in vitro Evaluation of Chitosan-Carrageenan, Chitosan-Alginate Beads for Controlled Release of Nateglinide, *Der Pharm Sin.*, 2(2), 375–384.
- Amarasinghe, B.M.W.P.K., and Williams, R.A., 2007, Tea Waste As a Low Cost Adsorbent for The Removal of Cu and Pb from Wastewater, *Chem. Eng. J.*, 132(1-3), 299–309.
- Anal, A.K., Bhopatkar, D., Tokura, S., Tamura, H., and Stevens, W.F., 2003, Chitosan-Alginate Multilayer Beads for Gastric Passage and Controlled Intestinal Release of Protein, *Drug Dev. Ind. Pharm.*, 29(6), 713–724.
- Anal, A.K., and Stevens, W.F., 2005, Chitosan–Alginate Multilayer Beads for Controlled Release of Ampicillin, *Int. J. Pharm.*, 290, 45–54.
- Andersen, T., Strand, B.L., Formo, K., Alsberg, E., and Christensen, B.E., 2012, Alginates as Biomaterials in Tissue Engineering, *Carbohydr. Chem*, 37, 227–258.
- Ansari, R., Mosayebzadeh, Z., Keivani, M.B., and Khah, A.M., 2011, Adsorption of Cationic Dye From Aqueous Solution Using Polyaniline Conducting Polymer as A Novel Adsorbent, *J. Adv. Sci. Res*, 2(2), 27–34.
- Auta, M., and Hameed, B., 2013, Acid Modified Local Clay Beads as Effective Low-Cost Adsorbent for Dynamic Adsorption of Methylene Blue, *J. Ind. Eng. Chem*, 19(4), 1153–1161.
- Bagre, A.P., Jain, K., and Jain, N.K., 2013, Alginate Coated Chitosan Core Shell Nanoparticles for Oral Delivery of Enoxaparin: in vitro and in vivo Assessment, *Int. J. Pharm.*, 456(1), 31–40.
- Baiocchi, C., Brussino, M.C., Pramauro, E., Prevot, A.B., Palmisano, L., and Marci, G., 2002, Characterization of Methyl Orange and Its Photocatalytic Degradation Products by HPLC/UV-VIS Diode Array and Atmospheric Pressure Ionization Quadrupole Ion Trap Mass Spectrometry, *Int. J. Mass Spectrom.*, 214(2), 247–256.

- Bansal, V., Sharma, P.K., Sharma, N., Pal, O.P., and Malviya, R., 2011, Applications of Chitosan and Chitosan Derivatives in Drug Delivery, *Advan. Biol. Res*, 5(1), 28–37.
- Begum, H.A., and Mahbub, M.K., 2013, Effectiveness of Carboxymethyl Cellulose for the Removal of Methylene Blue from Aqueous Solution, *J. Sci*, 61(2), 193–198.
- Berger, J., Reist, M., Mayer, J., Felt, O., Peppas, N., and Gurny, R., 2004, Structure and Interactions in Covalently and Ionically Crosslinked Chitosan Hydrogels for Biomedical Applications, *Eur. J. Pharm. Biopharm.*, 57, 19–34.
- Caparkaya, D., and Cavas, L., 2008, Biosorption of Methylene Blue by a Brown Alga *Cystoseira barbatula* Kutzing, *Acta Chim. Slov*, 55(3), 547–553.
- Canens, J. and Schoonheydt, R.A., 1988, Visible Spectroscopy of Methylene Blue on Hectorite, Laponite B, and Barasym in Aqueous suspension, *Clays Clay Mater.*, 36(3), 214–224.
- Chen, P., Kuo, T., Kuo, J., Tseng, Y., Wang, D., Lai, J., and Hsieh, H., 2010, Novel Chitosan–Pectin Composite Membranes with Enhanced Strength, Hydrophilicity and Controllable Disintegration, *Carbohydr. Polym*, 82(4), 1236–1242.
- Evaani, D., dan Cahyaningrum, S.E., 2012, Sintesis dan Pemanfaatan Kitosan-Alginat Sebagai Membran Ultrafiltrasi Ion K⁺, *UNESA. J. Chem*, 1(2), 7–13.
- Fajarwati, F.I., 2015, Efek Taut Silang Glutaraldehidaa pada Kompleks Polielektrolit Kitosan–Karboksimetil Selulosa terhadap Adsorpsi Biru metilena, *Tesis*, Departemen Kimia FMIPA UGM, Yogyakarta.
- Fil, B. A., Ozmetin, C., and Korkmaz, M., 2012, Cationic Dye (Methylene Blue) Removal from Aqueous Solution by Montmorillonite, *Bull. Korean Chem. Soc*, 33(10), 3184–3190.
- Gericke, M., Trygg, J., and Fardim, P., 2013, Functional Cellulose Beads: Preparation, Characterization, and Applications, *Chem. Rev.* 113, 4812–4836.
- Ghosh, D., and Bhattacharyya, K.G., 2002, Adsorption of Methylene Blue on Kaolinite, *Appl. Clay Sci.*, 20, 295–300.
- Giri, T.K., Thakur, A., Alexander, A., Ajazuddin, Badwaik, H., and Tripathi, D.K., 2012, Modified Chitosan Hydrogels as Drug Delivery and Tissue Engineering Systems: Present Status and Applications, *Acta Pharm. Sin. B*, 2(5), 439–449.
- Gotoh, T., Matsushima, K., and Kikuchi, K-I., 2004, Preparation of Alginate–Chitosan Hybrid Gel Beads and Adsorption of Divalent Metal Ions, *Chemosphere*, 55, 135–140.
- Gurses, A., Hassani, A., Kiransan, M., Acisli, O., and karaca, S., 2014, Removal of Methylene Blue from Aqueous Solution Using by Untreated Lignite as Potential Low-Cost Adsorbent: Kinetic, Thermodynamic and Equilibrium Approach, *J. Water Proces Eng*, 2, 10–21.

- Hamman, J. H., 2010, Chitosan Based Polyelectrolyte Complexes as Potential Carrier Materials in Drug Delivery Systems, *Mar. Drugs*, 8, 1305–1322.
- Hastuti, B., Masykur, A., dan Ifada, F., 2011, Modifikasi Kitosan Melalui Proses Swelling dan Crosslinking Menggunakan Glutaraldehid sebagai Pengadsorpsi Logam Cr(VI) pada Limbah Industri Batik, *J. Ekosains*, III(VI), 1–9.
- Ho, Y. S., and McKay, G., 2000, The Kinetics of Sorption of Divalent Metal Ions onto Sphagnum Moss Peat, *Wat. Res*, 34(3), 735–742.
- Hua, S., Ma, H., Li, X., Yang, H., and Wang, A., 2010, pH-Sensitive Sodium Alginate/Poly(Vinyl Alcohol) Hydrogel Beads Prepared by Combined Ca²⁺ Crosslinking and Freeze-Thawing Cycles for Controlled Release of Diclofenac Sodium, *Int. J. Biol. Macromol.*, 46(5), 517–523.
- 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 solution, *Int. J. Biol. Macromol.*, 49(4), 643–651.
- Jacobs, K.Y., and Schoonheydt, R.A., 1999, Spectroscopy of Methylene Blue–Smectite Suspensions, *J. Colloid Interface Sci.*, 111, 103–111.
- Jones, K., 2009, *FUSION 5 : A New Platform for Lateral Flow Immunoassay Tests*. Springer, New York.
- Kannan, N., and Sundaram, M.M., 2001, Kinetics and Mechanism of Removal of Methylene Blue by Adsorption on Various Carbons-A Comparative Study, *Dyes and Pigments*, 51, 25–40.
- Krasaekoopt, W., Bhandari, B., and Deeth, H., 2003, Evaluation of Encapsulation Techniques of Probiotics for Yoghurt, *J. Int. Dairy*, 13, 3–13.
- Kulig, D., Zimoch-Korzycka, A., Jarmoluk, A., and Marycz, K., 2016, Study on Alginate–Chitosan Complex Formed with Different Polymers Ratio, *Polymers*, 8(5), 167.
- Lawrie, G., Keen, I., Drew, B., Chandler-Temple, A., Rintoul, L., Fredericks, P., and Grondahl, L., 2007, Interactions Between Alginate and Chitosan Biopolymers Characterized using FTIR and XPS, *Biomacromolecules*, 8(8), 2533–2541.
- Li, L., Wang, L., Shao, Y., Ni, R., Zhang, T., and Mao, S., 2013, Drug Release Characteristics from Chitosan-Alginate Matrix Tablets Based on The Theory of Self-Assembled Film, *Int. J. Pharm.*, 450(1-2), 197–207.
- Li, Q., Song, B., Yang, Z., and Fan, H., 2006, Electrolytic Conductivity Behaviors and Solution Conformations of Chitosan in Different Acid Solutions, *Carbohydr. Polym.*, 63, 272–282.
- Liu, X., and Zhang, L., 2015, Removal of Phosphate Anions using The Modified Chitosan Beads: Adsorption Kinetic, Isotherm and Mechanism Studies, *Powder Technol.*, 277, 112–119.
- Lu, T., Xiang, T., Huang, X., Li, C., Zhao, W., Zhang, Q., and Zhao, C., 2015, Post-

- Crosslinking Towards Stimuli-Responsive Sodium Alginate Beads for The Removal of Dye and Heavy Metals, *Carbohydr. Polym.*, 133, 587–595.
- Luo, Y., and Wang, Q., 2014, Recent Development of Chitosan-Based Polyelectrolyte Complexes with Natural Polysaccharides for Drug Delivery, *Int. J. Biol. Macromol.*, 64, 353–367.
- Maciel, V.B.V, Yoshida, C.M., and Franco, T.T., 2015, Chitosan/Pectin Polyelectrolyte Complex as A pH Indicator, *Carbohydr. Polym.*, 132, 537–545.
- Martins, A. F., Bueno, P.V., Almeida, E.A.M., Rodrigues, F.H., Rubira, A.F., and Muniz, E.C., 2013, Characterization of N-trimethyl Chitosan/Alginate Complexes and Curcumin Release, *Int. J. Biol. Macromol.*, 57, 174–184.
- Mohy Eldin, M.S., Kamoun, E. A., Sofan, M.A., and Elbayomi, S.M., 2015, L-Arginine Grafted Alginate Hydrogel Beads: A Novel pH-Sensitive System for Specific Protein Delivery, *Arab. J. Chem.*, 8(3), 355–365.
- Nadavala, S.K., Swayampakula, K., Boddu, V.M., and Abburi, K., 2009, Biosorption of Phenol and o-Chlorophenol from Aqueous Solutions on to Chitosan–Calcium Alginate Blended Beads, *J. Hazard. Mater.*, 162, 482–489.
- Ngah, W. S. W., and Fatinathan, S., 2008, Adsorption of Cu(II) Ions in Aqueous Solution using Chitosan Beads, Chitosan–GLA Beads and Chitosan–Alginate Beads, *Chem. Eng. J.*, 143, 62–72.
- Ngah, W. S. W., and Fatinathan, S., 2010, Pb(II) Biosorption using Chitosan and Chitosan Derivatives Beads: Equilibrium, Ion Exchange and Mechanism Studies, *J. Env. Sci.*, 22(3), 338–346.
- Obeid, L., Kolli, N. El, Talbot, D., Welschbillig, M., and Bee, A., 2015, Influence of A Cationic Surfactant on Adsorption of p-Nitrophenol by a Magsorbent Based on Magnetic Alginate Beads, *J. Colloid Interface Sci.*, 457, 218–224.
- Ozer, A., and Dursun, G., 2007, Removal of Methylene Blue from Aqueous Solution by Dehydrated Wheat Bran Carbon, *J. Hazard. Mater.*, 146(1-2), 262–269.
- Palupi, E., 2006, Degradasi Metilen Biru dengan Metode Fotokatalisis dan Fotoelektrokatalisis Menggunakan Film TiO₂, *Tesis*, FMIPA IPB, Bogor.
- Park, H.G., Kim, T.W., Chae, M.Y., and Yoo, I., 2007, Activated Carbon-Containing Alginate Adsorbent for The Simultaneous Removal of Heavy Metals and Toxic Organics, *Process Biochem.*, 42, 1371–1377.
- Pasparakis, G., and Bouropoulos, N., 2006, Swelling Studies and in vitro Release of Verapamil from Calcium Alginate and Calcium Alginate–Chitosan Beads, *Int. J. Pharm.*, 323, 34–42.

- Prasetyo, E.A., 2015, Pembuatan Membran Makropori Kitosan Pektin Tertaut Silang Glutaraldehida sebagai Membran Adsorben Biru metilena, *Tesis*, Departemen Kimia FMIPA UGM, Yogyakarta.
- Quinones, J. P., Gothelf, K.V., Kjems, J., Yang, C., Caballero, A.M.H., Schmidt, C., and Covas, C.P., 2013, Self-Assembled Nanoparticles of Modified-Chitosan Conjugates for The Sustained Release of DL- α -Tocopherol, *Carbohydr. Polym.*, 92(1), 856–864.
- Ramya, R., Sudha, P., and Mahalakshmi, D., 2012, Preparation and Characterization of Chitosan Binary Blend, *Int. J. Sci. Res.*, 2(10), 1-9.
- Rastogi, K., Sahu, J.N., Meikap, B.C., and Biswas, M.N., 2008, Removal of Methylene Blue from Wastewater using Fly Ash as An Adsorbent by Hydrocyclone, *J. Hazard. Mater.*, 158, 531–540.
- Ren, H., Gao, Z., Wu, D., Jiang, J., Sun, Y., and Luo, C., 2016, Efficient Pb(II) Removal using Sodium Alginate–Carboxymethyl Cellulose Gel Beads: Preparation, Characterization, and Adsorption Mechanism, *Carbohydr. Polym.*, 137, 402–409.
- Saber-Samandari, S., Saber-Samandari, S., Nezafati, N., and Yahya, K., 2014 Efficient Removal of Lead(II) Ions and Methylene Blue from Aqueous Solution using Chitosan/Fe-Hydroxyapatite Nanocomposite Beads, *J. Environ.*, 146, 481–490.
- Saether, H.V., Holme, H. K., Maurstad, G., Smidsrod, O., and Stokke, B.T., 2008, Polyelectrolyte Complex Formation using Alginate and Chitosan, *Carbohydr. Polym.*, 74, 813–821.
- Saha, T.K., Bhoumik, N.C., Karmaker, S., Ahmed, M.G., Ichikawa, H., and Fukumori, Y., 2010, Adsorption of Methyl Orange onto Chitosan from Aqueous Solution, *J. Water Resource Prot.*, 2, 898–906.
- Sen, S., and Bhattacharyya, K.G., 2005, Interaction of Metal Ions with clays: I. A Case Study with Pb(II), *Appl. Clay Sci.*, 30, 199–208.
- Shahryari, Z., Goharrizi, A. S., and Azadi, M., 2010, Experimental Study of Methylene Blue Adsorption from Aqueous Solutions onto Carbon NanoTubes, *Int. J. Water Res. Environ. Eng.*, 2(2), 16–28.
- Shu, C., Chiew, C., Koon, H., Pasbakhsh, P., Eong, P., Tey, T., & Seng, E., 2016, Stability and Reusability of Alginate Based Adsorbents for Repetitive Lead (II) Removal, *Polym. Degrad. Stab.*, 123, 146–154.
- Singh, V., 2015, Mesoporous Titania Spheres Derived from Sodium Alginate-Gum Acacia Composite Beads: Efficient Adsorbent for Reactive Blue H5G Dye, *J. Environ. Chem. Eng.*, 3(4), 2727–2737.
- Soedjak, H.S., 1994, Colorimetric Determination of Carrageenans and Other Anionic Hydrocolloids with Methylene Blue, *Anal. Chem.*, 66(24), 4514–4518.

- Soni, M., K.Sharma, A., K.Srivastava, J., and Yadav, J.S., 2012, Adsorptive Removal of Methylene Blue Dye From An Aqueous Solution Using Water Hyacinth Root Powder as A Low Cost Adsorbent, *Int. J. Chem. Sci. Appl.*, 3(3), 338–345.
- Suharyani, E.W.F., 2015, Pembuatan Nanofiber Paduan Kitosan-Pektin-Polivinil Alkohol dengan Electrosinning sebagai Adsorben Biru metilena, *Tesis*, Departemen Kimia FMIPA UGM, Yogyakarta.
- Sun, X., Shi, J., Xu, X., and Cao, S., 2013, Chitosan Coated Alginate/Poly (N-isopropylacrylamide) Beads for Dual Responsive Drug Delivery, *Int. J. Biol. Macromol.*, 59, 273–281.
- Tabbaral, M., and Jamal, M. El., 2012, A Kinetics Study of The Discollration of Methylene Blue by Na₂SO₃ Comparison with NaOH, *J. Univ. Chem. Technol. Metall*, 47(3), 275-282.
- Tammi, T., Suaniti, N. M., dan Manurung, M., 2013, Variasi Konsentrasi dan pH Terhadap Kemampuan Kitosan dalam Mengadsorpsi Metilen Biru, *Jurnal Kimia*, 7(1), 11–18.
- Tanasale, M.F.J.D.P., Killay, A., dan Laratmase, M.S., 2012. Kitosan dari Limbah Kulit Kepiting Rajungan (*Portunus sanguinolentus* L.) sebagai Adsorben Zat Warna Biru metilena, *J. Natur Indones*, 14(2), 165–171.
- Untailawan, R., 2015, Adsorpsi dan Desorpsi Metilen Biru pada Film Polielektrolit Kompleks Kitosan-Pektin Tertaut Silang Polielliten Glikol Diglisidil Eter, *Tesis*, Departemen Kimia FMIPA UGM, Yogyakarta.
- Vijayalakshmi, K., Gomathi, T., Latha, S., Hajeeth, T., and Sudha, P.N., 2016, Removal of Copper (II) from Aqueous Solution using Nanochitosan/ Sodium Alginate/Microcrystalline Cellulose Beads, *Int. J. Biol. Macromol.*, 82, 440–452.
- Wang, M., and Wang, L., 2013, Synthesis and Characterization of Carboxymethyl Cellulose/Organic Montmorillonite Nanocomposites and Its Adsorption Behavior for Congo Red Dye, *Water Sci. Eng.*, 6, 272–282.
- Xu, Y. X., Kim, K. M., Hanna, M. A., and Nag, D., 2005, Chitosan–Starch Composite Film: Preparation and Characterization, *Ind. Crops Prod*, 21, 185–192.
- Yeul, V. S., and Rayalu, S.S., 2013, Unprecedented Chitin and Chitosan: A Chemical Overview, *J. Polym. Environ*, 21, 606–614.
- Zhu, C. S., Wang, L. P., and Chen, W. bin., 2009, Removal of Cu(II) from Aqueous Solution by Agricultural by Product: Peanut Hull, *J. Hazard. Mater.*, 168 (2-3), 739–746.
- Zuo, X., and Balasubramanian, R., 2013, Evaluation of A Novel Chitosan Polymer-Based Adsorbent for The Removal of Chromium(III) in Aqueous Solutions, *Carbohydr. Polym.*, 92(2), 2181–2186.