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DAFTAR PUSTAKA

[1] M. A. Ashraf, S. Akib, Mohd. J. Maah, I. Yusoff, and K. S. Balkhair, "Cesium-137: Radio-Chemistry, Fate, and Transport, Remediation, and Future Concerns," *Critical Reviews in Environmental Science and Technology*, vol. 44, no. 15, pp. 1740–1793, Aug. 2014, doi: 10.1080/10643389.2013.790753.

[2] Y.-J. Tu, C.-F. You, Z. Zhang, Y. Duan, J. Fu, and D. Xu, "Strontium Removal in Seawater by Means of Composite Magnetic Nanoparticles Derived from Industrial Sludge," *Water*, vol. 8, no. 8, p. 357, Aug. 2016, doi: 10.3390/w8080357.

[3] S. Khandaker, Y. Toyohara, S. Kamida, and T. Kuba, "Adsorptive Removal of Cesium from Aqueous Solution Using Oxidized Bamboo Charcoal," *Water Resources and Industry*, vol. 19, pp. 35–46, Jun. 2018, doi: 10.1016/j.wri.2018.01.001.

[4] C. Kütahyalı and M. Eral, "Selective Adsorption of Uranium from Aqueous Solutions Using Activated Carbon Prepared from Charcoal by Chemical Activation," *Separation and Purification Technology*, vol. 40, no. 2, pp. 109–114, Dec. 2004, doi: 10.1016/j.seppur.2004.01.011.

[5] E. Kaçan and C. Kütahyalı, "Adsorption of Strontium from Aqueous Solution Using Activated Carbon Produced from Textile Sewage Sludges," *Journal of Analytical and Applied Pyrolysis*, vol. 97, pp. 149–157, Sep. 2012, doi: 10.1016/j.jaap.2012.06.006.

[6] E. Lorencgrabowska and G. Gryglewicz, "Adsorption Characteristics of Congo Red on Coal-Based Mesoporous Activated Carbon," *Dyes and Pigments*, vol. 74, no. 1, pp. 34–40, 2007, doi: 10.1016/j.dyepig.2006.01.027.

[7] A. Mohammad-Khah and R. Ansari, "Activated Charcoal: Preparation, Characterization and Applications : A Review Article," vol. 1, no. 4, pp. 859–864, 2009.

[8] S. Mahanim, I. W. Asma, J. Rafidah, E. Puad, and H. Shaharuddin, "Production of Activated Carbon from Industrial Bamboo Wastes," *Journal of Tropical Forest Science*, vol. 23, no. 4, pp. 417–424, 2011.

[9] E. M. Mistar, T. Alfatah, and M. D. Supardan, "Synthesis and Characterization of Activated Carbon from Bambusa Vulgaris Striata Using Two-step KOH Activation," *Journal of Materials Research and Technology*, vol. 9, no. 3, pp. 6278–6286, May 2020, doi: 10.1016/j.jmrt.2020.03.041.

[10] D. Angın, E. Altintig, and T. E. Köse, "Influence of Process Parameters on The Surface and Chemical Properties of Activated Carbon Obtained from Biochar

UNIVERSITAS GADJAH MADA
Pengaruh Konsentrasi H2SO4 dan Suhu Aktivasi pada Sintesis Karbon Aktif dari Bambu (Giganthochloa Apus) sebagai Adsorben Limbah Stronsium-90
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by Chemical Activation," *Bioresource Technology*, vol. 148, pp. 542–549, Nov. 2013, doi: 10.1016/j.biortech.2013.08.164.

[11] P. G. González, T. Hernández-Quiroz, and L. García-González, "The Use of Experimental Design and Response Surface Methodologies for The Synthesis of Chemically Activated Carbons Produced from Bamboo," *Fuel Processing Technology*, vol. 127, pp. 133–139, Nov. 2014, doi: 10.1016/j.fuproc.2014.05.035.

[12] A. H. Jawad, R. Razuan, J. N. Appaturi, and L. D. Wilson, "Adsorption and Mechanism Study for Methylene Blue Dye Removal with Carbonized Watermelon (Citrullus Lanatus) Rind Prepared Via One-step Liquid Phase H2SO4 Activation," *Surfaces and Interfaces*, vol. 16, pp. 76–84, Sep. 2019, doi: 10.1016/j.surfin.2019.04.012.

[13] A. Rahman *et al.*, "Chemical Preparation of Activated Carbon from Acacia Erioloba Seed Pods Using H_2SO_4 as Impregnating Agent for Water Treatment: An Environmentally Benevolent Approach," *Journal of Cleaner Production*, vol. 237, p. 117689, Nov. 2019, doi: 10.1016/j.jclepro.2019.117689.

[14] I. Osasona and U. B. Kanuhor, "Characterization and Utilization of Sulphuric Acid and Bitter Leaf Extract Activated Carbon from Rice Husk for Zn(II) Adsorption," *Indonesia. J. Chem.*, vol. 21, no. 2, p. 318, Mar. 2021, doi: 10.22146/ijc.54786.

[15] H. S. Jahin, "Adsorption of Methyl Red from Aqueous Solutions Using Activated Carbon Prepared from Coffee Residue," vol. 3, no. 2, pp. 126–132, 2014.

[16] A. Chakraborty, A. Pal, and B. B. Saha, "A Critical Review of the Removal of Radionuclides from Wastewater Employing Activated Carbon as an Adsorbent," *Materials*, vol. 15, no. 24, Art. no. 24, Jan. 2022, doi: 10.3390/ma15248818.

[17] Y. Shao *et al.*, "Chemical Modification of Bamboo Activated Carbon Surface and Its Adsorption Property of Simultaneous Removal of Phosphate and Nitrate," *Chemosphere*, vol. 287, p. 132118, Jan. 2022, doi: 10.1016/j.chemosphere.2021.132118.

[18] S. Wong, N. A. N. Yac'cob, N. Ngadi, O. Hassan, and I. M. Inuwa, "From Pollutant to Solution of Wastewater Pollution: Synthesis of Activated Carbon from Textile Sludge for Dye Adsorption," *Chinese Journal of Chemical Engineering*, vol. 26, no. 4, pp. 870–878, Apr. 2018, doi: 10.1016/j.cjche.2017.07.015.

[19] A. H. Jawad, R. A. Rashid, M. A. M. Ishak, and L. D. Wilson, "Adsorption of Methylene Blue onto Activated Carbon Developed from Biomass Waste by H2SO4 Activation: Kinetic, Equilibrium and Thermodynamic Studies.," *Desalination and Water Treatment*, vol. 57, no. 52, pp. 25194–25206, Nov. 2016, doi: 10.1080/19443994.2016.1144534.

UNIVERSITAS
GADJAH MADA
**Pengaruh Konsentrasi H2SO4 dan Suhu Aktivasi pada Sintesis Karbon Aktif dari Bambu (Giganthochloa
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Universitas Gadjah Mada, 2023 | Diunduh dari http://etd.repository.ugm.ac.id/

[20] A. M. S. Ngueabouo, R. F. T. Tagne, D. R. T. Tchuifon, C. G. Fotsop, A. K. Tamo, and S. G. Anagho, "Strategy for Optimizing The Synthesis and Characterization of Activated Carbons Obtained by Chemical Activation of Coffee Husk," *Mater. Adv.*, vol. 3, no. 22, pp. 8361–8374, 2022, doi: 10.1039/D2MA00591C.

[21] S. Hayakawa, S. Matsubara, Y. Sumi, S. Yamamoto, N. Kawamura, and T. Nonami, "Caesium and Strontium Adsorption Ability of Activated Bamboo Charcoal.", *Int. J. Nanotechnol*, vol. 15, no. 8/9/10, 2018.

[22] Y. Zheng *et al.*, "Influence of Temperature on Adsorption Selectivity: Coal-Based Activated Carbon for CH4 Enrichment from Coal Mine Methane," *Powder Technology*, vol. 347, pp. 42–49, Apr. 2019, doi: 10.1016/j.powtec.2019.02.042.

[23] Ü. Geçgel, G. Özcan, and G. Ç. Gürpınar, "Removal of Methylene Blue from Aqueous Solution by Activated Carbon Prepared from Pea Shells (*Pisum sativum*)," *Journal of Chemistry*, vol. 2013, pp. 1–9, 2013, doi: 10.1155/2013/614083.

[24] M. Caccin, F. Giacobbo, M. Da Ros, L. Besozzi, and M. Mariani, "Adsorption of Uranium, Cesium and Strontium onto Coconut Shell Activated Carbon," *J Radioanal Nucl Chem*, vol. 297, no. 1, pp. 9–18, Jul. 2013, doi: 10.1007/s10967-012-2305-x.

[25] K. T. Basuki, M. Fatuzzahroh, D. Ariyanti, and A. Saputra, "Adsorption of Strontium from an Aqueous Solution by TiO2-Pillared Zeolite," *IJTech*, vol. 12, no. 3, p. 625, Jul. 2021, doi: 10.14716/ijtech.v12i3.4376.

[26] S. Yusan and S. Erenturk, "Adsorption Characterization of Strontium on PAN/Zeolite Composite Adsorbent," *WJNST*, vol. 01, no. 01, pp. 6–12, 2011, doi: 10.4236/wjnst.2011.11002.

[27] M. L. Hakim, "Analisis Kemampuan Arang Aktif Berbahan Baku Tempurung Kelapa sebagai Penjerap Stronsium,", *Skripsi*, Departemen Teknik Nuklir dan Teknik Fisika, Universitas Gadjah Mada, 2014.

[28] D. Deng, L. Zhang, M. Dong, R. E. Samuel, A. Ofori-Boadu, and M. Lamssali, "Radioactive waste: A review," *Water Environment Research*, vol. 92, no. 10, pp. 1818–1825, Oct. 2020, doi: 10.1002/wer.1442.

[29] G. Turkington, K. A. A. Gamage, and J. Graham, "Beta Detection of Strontium-90 and The Potential for Direct in Situ Beta Detection for Nuclear Decommissioning Applications," *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, vol. 911, pp. 55–65, Dec. 2018, doi: 10.1016/j.nima.2018.09.101.

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2023 | Diunduh dari http://etd.repository.ugm.ac.id/

[30] G. Lastovicka-Medin, "Strontium-90: A Review of Measurement Techniques Including Releases to The Environment, Its Carcinogenic Properties and U.S. EPA Recomended Activity Levels".

[31] "Strontium-90," laradioactivite.com. Accessed: Nov. 16, 2023. [Online]. Available: https://laradioactivitefr.gatsbyjs.io/phenomenon/strontium_90

[32] J. Xu *et al.*, "A Review of Functionalized Carbon Nanotubes and Graphene for Heavy Metal Adsorption from Water: Preparation, Application, and Mechanism," *Chemosphere*, vol. 195, pp. 351–364, Mar. 2018, doi: 10.1016/j.chemosphere.2017.12.061.

[33] H. Ma, M. Shen, Y. Tong, and X. Wang, "Radioactive Wastewater Treatment Technologies: A Review," *Molecules*, vol. 28, no. 4, p. 1935, Feb. 2023, doi: 10.3390/molecules28041935.

[34] A. O. Adeola *et al.*, "Advances in The Management of Radioactive Wastes and Radionuclide Contamination in Environmental Compartments: A Review," *Environ Geochem Health*, vol. 45, no. 6, pp. 2663–2689, Jun. 2023, doi: 10.1007/s10653-022-01378-7.

[35] R. Kecili and Chaudhery Mustansar Hussain, "Chapter 4 - Mechanism of Adsorption on Nanomaterials," pp. 89–115, 2018, doi: http://dx.doi.org/10.1016/B978-0-12-812792-6.00004-2.

[36] S. Mokhatab, W. A. Poe, and J. Y. Mak, "Natural Gas Dehydration and Mercaptans Removal," in *Handbook of Natural Gas Transmission and Processing*, Elsevier, 2019, pp. 307–348. doi: 10.1016/B978-0-12-815817-3.00009-5.

[37] A. K. Singh, "Structure, Synthesis, and Application of Nanoparticles," in *Engineered Nanoparticles*, Elsevier, 2016, pp. 19–76. doi: 10.1016/B978-0-12-801406-6.00002-9.

[38] A. R. Leach, "Ligand-Based Approaches: Core Molecular Modeling," in *Comprehensive Medicinal Chemistry II*, Elsevier, 2007, pp. 87–118. doi: 10.1016/B0-08-045044-X/00246-7.

[39] E. Hadjittofis, S. C. Das, G. G. Z. Zhang, and J. Y. Y. Heng, "Interfacial Phenomena," in *Developing Solid Oral Dosage Forms*, Elsevier, 2017, pp. 225–252. doi: 10.1016/B978-0-12-802447-8.00008-X.

[40] M. S. Muzarpar and A. M. Leman, "The Adsorption Mechanism of Activated Carbon and Its Application - A Review," *International Journal of Advanced Technology in Mechanical, Mechatronics and Materials*, vol. 1, no. 3, pp. 118–124, Jan. 2021, doi: 10.37869/ijatec.v1i3.37.

UNIVERSITAS
GADJAH MADA
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Universitas Gadjah Mada, 2023 | Diunduh dari http://etd.repository.ugm.ac.id/

[41] F. Rodrfguez-Reinoso and A. Escribano, "Porous Carbons in Adsorption and Catalysis," *Biomolecules, Biointerfaces, and Applications*, vol. 5, pp. 309–355, 2001.

[42] A. Bhatnagar, W. Hogland, M. Marques, and M. Sillanpää, "An Overview of The Modification Methods of Activated Carbon for Its Water Treatment Applications," *Chemical Engineering Journal*, vol. 219, pp. 499–511, Mar. 2013, doi: 10.1016/j.cej.2012.12.038.

[43] J. Rivera-Utrilla, M. Sánchez-Polo, V. Gómez-Serrano, P. M. Álvarez, M. C. M. Alvim-Ferraz, and J. M. Dias, "Activated Carbon Modifications to Enhance Its Water Treatment Applications. An Overview," *Journal of Hazardous Materials*, vol. 187, no. 1–3, pp. 1–23, Mar. 2011, doi: 10.1016/j.jhazmat.2011.01.033.

[44] J. M. Dias, M. C. M. Alvim-Ferraz, M. F. Almeida, J. Rivera-Utrilla, and M. Sánchez-Polo, "Waste Materials for Activated Carbon Preparation and Its Use in Aqueous-Phase Treatment: A Review," *Journal of Environmental Management*, vol. 85, no. 4, pp. 833–846, Dec. 2007, doi: 10.1016/j.jenvman.2007.07.031.

[45] E. A. Deliyanni, "Low-Cost Activated Carbon from Rice Wastes in Liquid-Phase Adsorption," in *Interface Science and Technology*, vol. 30, Elsevier, 2019, pp. 101–123. doi: 10.1016/B978-0-12-814178-6.00005-4.

[46] A. Świątkowski, "Industrial Carbon Adsorbents," in *Studies in Surface Science and Catalysis*, vol. 120, Elsevier, 1999, pp. 69–94. doi: 10.1016/S0167-2991(99)80549-7.

[47] P. González-García, "Activated Carbon from Lignocellulosics Precursors: A Review of The Synthesis Methods, Characterization Techniques and Applications," *Renewable and Sustainable Energy Reviews*, vol. 82, pp. 1393–1414, Feb. 2018, doi: 10.1016/j.rser.2017.04.117.

[48] F. Yang *et al.*, "Bamboo-Based Magnetic Activated Carbon for Efficient Removal of Sulfadiazine: Application and Adsorption Mechanism," *Chemosphere*, vol. 323, p. 138245, May 2023, doi: 10.1016/j.chemosphere.2023.138245.

[49] D. S. B. Hashim, J. Y. Liew, J. G. Boon, and H. Y. Ch'ng, "Multipurpose Applications of Bamboo as an Activated Carbon: An Overview," *JANS*, vol. 14, no. 2, pp. 522–530, Jun. 2022, doi: 10.31018/jans.v14i2.3406.

[50] M. A. Tadda *et al.*, "A Review on Activated Carbon: Process, Application and Prospects", *Journal of Advanced Civil Engineering Practice and Research*, vol. 2, no. 1, pp. 7-13, 2016.

[51] Y. Hendrawan, N. Sajidah, C. Umam, M. R. Fauzy, Y. Wibisono, and L. C. Hawa, "Effect of Carbonization Temperature Variations and Activator Agent Types on Activated Carbon Characteristics of Sengon Wood Waste (*Paraserianthes*

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Universitas Gadjah Mada, 2023 | Diunduh dari http://etd.repository.ugm.ac.id/

falcataria (L.) Nielsen)," *IOP Conf. Ser.: Earth Environ. Sci.*, vol. 239, p. 012006, Feb. 2019, doi: 10.1088/1755-1315/239/1/012006.

[52] O. Ioannidou and A. Zabaniotou, "Agricultural Residues as Precursors for Activated Carbon Production—A Review," *Renewable and Sustainable Energy Reviews*, vol. 11, no. 9, pp. 1966–2005, Dec. 2007, doi: 10.1016/j.rser.2006.03.013.

[53] P. J. Johnson, D. J. Setsuda, and R. S. Williams, "Activated Carbon for Automotive Applications," in *Carbon Materials for Advanced Technologies*, Elsevier, 1999, pp. 235–268. doi: 10.1016/B978-008042683-9/50010-8.

[54] J. Kimia, "Preparation and Characterization of Activated Carbon from Gelam". *Malaysian Journal of Analytical Sciences*, vol. 7, no. 1, pp. 65-68, 2001.

[55] A. R. Hidayu *et al.*, "Preparation of Activated Carbon from Palm Kernel Shell by Chemical Activation and Its Application for β-Carotene Adsorption in Crude Palm Oil," *J. Phys.: Conf. Ser.*, vol. 1349, no. 1, p. 012103, Nov. 2019, doi: 10.1088/1742-6596/1349/1/012103.

[56] Z. Nadiah, "To Produce The Activated Carbon from Matured Palm Kernel Shell." *Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang*, 2010.

[57] L. O. Ajala and E. E. Ali, "Preparation and Characterization of Groundnut Shell-Based Activated Charcoal, " *jasem*, vol. 24, no. 12, pp. 2139–2146, Feb. 2021, doi: 10.4314/jasem.v24i12.20.

[58] E. Zhou *et al.*, "Study of The Combination of Sulfuric Acid Treatment and Thermal Regeneration of Spent Powdered Activated Carbons from Decolourization Process in Glucosamine Production," *Chemical Engineering and Processing: Process Intensification*, vol. 121, pp. 224–231, Nov. 2017, doi: 10.1016/j.cep.2017.09.008.

[59] J. G. Speight, "Industrial Inorganic Chemistry," in *Environmental Inorganic Chemistry for Engineers*, Elsevier, 2017, pp. 111–169. doi: 10.1016/B978-0-12-849891-0.00003-5.

[60] A. Rehman, M. Park, and S.-J. Park, "Current Progress on the Surface Chemical Modification of Carbonaceous Materials," *Coatings*, vol. 9, no. 2, p. 103, Feb. 2019, doi: 10.3390/coatings9020103.

[61] D. J. Butcher, "Atomic Absorption Spectrometry | Interferences and Background Correction," in *Encyclopedia of Analytical Science*, Elsevier, 2005, pp. 157–163. doi: 10.1016/B0-12-369397-7/00025-X.

[62] "Atomic Absorption Spectroscopy, How Does AAS Work, AAS FAQs | Agilent." Accessed: Aug. 23, 2023. [Online]. Available:

UNIVERSITAS
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https://www.agilent.com/en/support/atomic-spectroscopy/atomic-absorption/flame-atomic-absorption-instruments/how-does-aas-work-aas-faqs

[63] K. A. Mohamad Said and M. A. Mohamed Amin, "Overview on the Response Surface Methodology (RSM) in Extraction Processes," *JASPE*, vol. 2, no. 1, May 2016, doi: 10.33736/jaspe.161.2015.

[64] L. A. Sarabia and M. C. Ortiz, "Response Surface Methodology", *Elsevier*, pp. 345-390, 2009

[65] "What Are Response Surface Designs, Central Composite Designs, and Box-Behnken Designs?" Accessed: Nov. 16, 2023. [Online]. Available: https://support.minitab.com/en-us/minitab/21/help-and-how-to/statistical-modeling/doe/supporting-topics/response-surface-designs/response-surface-central-composite-and-box-behnken-designs/

[66] "Numeracy, Maths and Statistics - Academic Skills Kit." Accessed: Aug. 24, 2023. [Online]. Available: https://www.ncl.ac.uk/webtemplate/ask-assets/external/maths-resources/statistics/regression-and-correlation/coefficient-of-determination-r-squared.html