

DAFTAR PUSTAKA

- A, González., et al. 2016. Review on supercapacitors: technologies and materials. *Renewable and Sustainable Energy*. vol. 58,pp. 1189-1206.
- Abioye, A. M., Ani, F. N. 2015. Recent development in the production of activated carbon electrodes from agricultural waste biomass for supercapacitors: A review. *Renewable and Sustainable Energy Reviews*. 52 : 1282–1293.
- Alberto, Adan-Mas., Lorena Alcaraz., Pablo Arévalo-Cid., Félix. A. López-Gómez., Fátima Montemor. 2021. Coffee-derived activated carbon from second biowaste for supercapacitor applications. *Waste Management*. 120 : 280-289.
- Armynah B, Taer E, Djafar Z, Piarah W H and Tahir D. 2019. *Int. J. Electrochem. Sci.* 14 : 7076.
- Asim, A. Mohammed., Chao, Chen., Zhihong, Zhu. 2018. Low-Cost, High-Performance Supercapacitor Based on Activated Carbon Electrode Materials Derived from Baobab Fruit Shells. *Journal of Colloid and Interface Science*. S0021-9797 (18) 31426-7.
- Aziz, H., Tetra, O.N., Alif, A., Syukri, Ramadhan W. 2016. Electrical properties of supercapacitor electrode-based on activated carbon from waste palm kernel shells. *Der Pharma Chemica*. 8(15), 227-232.
- Baojun, Yu., Zhenzhen, Chang. 2016. The key pre-pyrolysis in lignin based activated carbon preparation for high performance supercapacitors. *Material Chemistry and physics*. 1-7.
- Barmawi, I., Taer, E., Umar, A., Lukita, J., Lustania. 2012. Penumbuhan Nanopartikel Logam dengan Metode Kimia Basah untuk Meningkatkan Prestasi Superkapasitor Elektrokimia. Prosiding SNTK TOPI, Pekanbaru.
- Boyjoo, Y., Cheng, Y., Zhong, H., Tian, H., Pan, J., Pareek, VK., et al. 2017. From waste Coca Cola® to activated carbons with impressive capabilities for CO₂ adsorption and supercapacitors. *Carbon*. 116 : 490-9.

- Bunaciu, A.A., Udristioiu, E.G., Aboul, H.Y. 2015. X-Ray diffraction instrumentation and applications. *Critical Reviews in Analytical Chemistry*. 45 : 289-299.
- C, Yuan., X, Zhang., L, Su., B, Gao., L, Shen. 2009. Facile synthesis and self-assembly of hierarchical porous NiO nano/micro spherical superstructures for high performance supercapacitors. *J. Mater. Chem.* 19 : 5772–5777.
- C, Zhong., S, Gong., L, e. Jin., P, Li., Q, Cao. 2015. Preparation of nitrogen-doped pitch based carbon materials for supercapacitors. *Materials Letters*. 156 : 1–6.
- Chen, Hao Wang., Wei, Chen Wen., Hsin, Cheng Hsu., Bing, Yuan Yao. 2016. High-capacitance KOH-activated nitrogen-containing porous carbon material from waste coffee grounds in supercapacitor. *Advanced Powder Technology*. Volume 27 : 1387-1395.
- Chen, T., Dai, L. 2013. Carbon nanomaterials for highperformance supercapacitors. *Materials Today*. 16 : 272-280.
- Chiu, Yi-Han and Lin, Lu-Yin. 2019. Effect of activated agents for producing activated carbon using a facile one-step synthesis with waste coffee grounds for symmetric supercapacitor. *Journal of the taiwan institute of chemical engineers*. (101) 177-185.
- Climent, V. & Feliu, J.M. 2018. Cyclic voltammetry. Encyclopedia of Interfacial Chemistry: *Surface Science and Electrochemistry*. hal.48–74.
- D, Liu., W, Zhang., H, Lin., Y, Li., H, Lu., Y, Wang. 2016. A green technology for the preparation of high capacitance rice husk-based activated carbon. *J. Clean. Prod.* 112 : 1190–1198.
- Danish, M., Ahmad T. 2018. A review on utilization of wood biomass as a sustainable precursor for activated carbon production and application. *Renew Sustain Energy Rev.* 87 : 1–21.
- Deng, P., Lei, S., Wang, W., Zhou, W., Ou, X., Chen, L., Xiao, Y. & Cheng, B. 2018. Conversion of biomass waste to multi-heteroatom-doped carbon networks with high surface area and hierarchical porosity for advanced supercapacitors. *Journal of Materials Science*, 53(20): 14536–14547.

- De Lange., M F. et al. 2014. Adsorptive characterization of porous solids: Error analysis guides the way. *Microporous and Mesoporous Materials.* 200 : 199–21
- Espinoza-acosta JL., Torres-chávez PI., Olmedo-martínez JL., Vega-rios A., Flores-gallardo S., Zaragoza-contreras EA. 2018. Lignin in storage and renewable energy applications: a review. *J Energy Chem.* 27 : 1422 – 1438.
- Fic. K., Platek A., Piwek J., Frackowiak E. 2018. Sustainable materials for electrochemical capacitors. *Mater Today.* 21 : 437–454.
- González, A., Goikolea, E., Barrena, J. A., and Mysyk, R., 2016, “Review on Supercapacitors: Technologies and Materials,” *Renewable Sustainable Energy Rev.*, 58, pp. 1189–1206.
- Gonzalez., Garcia P. 2018. Activated carbon from lignocellulosics precursors: a review of the synthesis methods, characterization techniques and applications. *Renew Sustain Energy Rev.* 82 : 1393 – 1414.
- Grandys, P Rika., D, Istria., P, R Ahmad., F, Amanda P. 2004. Analisis luas permukaan arang aktif dengan menggunakan metode BET (SAA). Universitas Negeri Semarang, Semarang.
- Gunawan, B., Azhari, C. 2010. Karakterisasi spektrofotometri IR dan Scanning Elektron Microscopy (SEM) sensor gas dari bahan polimer poly ethylen glicol (PEG). *Jurnal Sains dan Teknologi.* 3 : 1-17.
- H, Jiang., P, S Lee., C, Li. 2013. 3D carbon based nanostructures for advanced supercapacitors. *Energy Environ. Sci.* 6 : 41–53.
- H. Jin, X. Wang, Z. Gu, J.D. Hoefelmeyer, K. Muthukumarappan, J. Julson. 2014. Graphitized activated carbon based on big bluestem as an electrode for supercapacitors. *RSC Advances.* 4 : 14136.
- H, Sun., S, L. Xie., Y, M. Li., Y, S. Jiang., X, M. Sun., B, J. Wang., H, S. Peng. 2016. Large-area supercapacitor textiles with novel hierarchical conducting structures. *Adv. Mater.* 28 : 8431–8438.
- H, Wang., Q. Gao., J. Hu. 2010. Mircopore and Mesopore. *Mater.* 131 : 89.
- Hasanah, Husnul., Syukri., Aziz, Hermansyah. 2020. Synthesis of Activated Carbon From Wate Tea by KOH Activation as High Performance Supercapacitors Electrodes. *J. Chem. Pharm. Res.* 12 (6) : 6-12.

- He, S-S., Hu, Y-J., Wan, J-X., Gao, Q., Wang, Y-H., Xie, S-L., et al. 2017. Biocompatible carbon nanotube fibers for implantable supercapacitors. *Carbon*. 122 : 162-167.
- Huang G, Liu Y, Wu X, Cai J (2019) Activated carbons prepared by the KOH activation of a hydrochar from garlic peel and their CO₂ adsorption performance. *New Carbon Mater* 34:247–257.
- I, I.G. Inal., S, M. Holmes., A, Banford., Z, Aktas. 2015. The performance of supercapacitor electrodes developed from chemically activated carbon produced from waste tea. *Applied Surface Science*. 357 : 696–703.
- Iqbal, M.F., Ashiq, M.N., Hassan, M.U., Nawaz, R., Masood, A., Razaq, A. 2018. Excellent electrochemical behavior of graphene oxide based aluminum sulfide nanowalls for supercapacitor applications. *Energy*. 159 : 151-159.
- J, Ji., L, Zhang., H, Ji., Y, Li., X, Zhao., X, Bai., X, Fan., F, Zhang., R, S, Ruoff. 2013. Nanoporous Ni(OH)₂ thin film on 3D ultrathin-graphite foam for asymmetric supercapacitor. *ACS Nano*. 7 : 6237–6243.
- J. S. M, B. G. Sumpter, V. Meunier, Angewandte. 2008. *Chemie International Ed*. 47 : 520.
- Jiang, W., Li L., Pan J., Senthil RA., Jin X., Cai J., Wang J., Liu X. 2019. Hollow-tubular porous carbon derived from cotton with high productivity for enhanced performance supercapacitor. *J Power Sources*. 438 : 226936.
- Joni, Rahma., Syukri., Aziz, H. 2021. Study of Activated Carbon Characteristic from Ketaping Fruit Shell (*Terminalia Catappa*) as Supercapacitor Electrode. *J. Aceh Phys Soc*. 10(1) : 1-6.
- K, Huang., J, Zhang., G, Shi., Y, Liu. 2014. Hydrothermal synthesis of molybdenum disulfide nanosheets as supercapacitors electrode material. *Electrochim. Acta*. 132 : 397–403.
- Kamikuri, N., Hamasuna, Y., Tashima, D., Fukuma, M., Kumagai S., Madden J., D, W. 2014. Low-cost Activated Carbon Materials Produced from Used Coffee Grounds for Electric Double-layer Capacitors. *International Journal of Engineering Science and Innovative Technology (IJESIT)*. 3492-501.

- Kampouris, D.K., Ji, X., Randviir, E.P. & Banks, C.E. 2015. A new approach for the improved interpretation of capacitance measurements for materials utilised in energy storage. *RSC Advances*, 5(17): 12782–12791.
- Li, X., Wei, B. 2013. Supercapacitors based on nanostructured carbon. *Nano Energy*. 2 : 159–173.
- Liew, C. W., Ramesh, S., Arof, A. K. 2015. Characterization of ionic liquid added poly(vinyl alcohol) based proton conducting polymer electrolytes and electrochemical studies on the supercapacitors. *Int. J. Hydrog. Energy*. 40 : 852–862.
- Mariana., Marwan., F, Mulana. 2018. Activation and characterization of waste coffee grounds as bio-sorbent. *Materials Science and Engineering*. 334 : 012029.
- Marsh, Harry., Rodriguez, Francisco., Reinoso. 2006. *Activated Carbon*. ELSEVIER. United Kingdom.
- Merlet, C., Rotenberg, B., Madden, P.A., Taberna, P L., Simon, P., Gogotsi, Y., Salanne, M. 2012. On the molecular origin of supercapacitance in nanoporous carbon electrodes. *Nat. Mater.* 11 : 306–310.
- Misnon, I.I., Khairiyah, N., Radhiyah, M.Z., Baiju, A.A., Jose, V.R.. 2015. Electrochemical properties of carbon from oil palm kernel shell for high performance supercapacitors. *Electrochimica Acta*. 174 (1):78-86.
- O, S. Amuda., A, A. Giwa., I, A. Bello. 2007. Removal of heavy metal from industrial wastewater using modified activated coconut shell carbon. *Biochem. Eng. J.* 36 : 174–181.
- P, Esquivel., V, M. Jimenez. 2012. Functional Properties of coffee and coffee by products. *Food Res. Int.* 46 : 488-495.
- P, Sharma and T, S. Bhatti. 2010. A review on electrochemical double-layer capacitors. *Energy Conversion and Management*. vol. 51,pp. 2901-2912.
- Pagketananga, T., Artnaseawa, A., Wongwichaa, P., Thabuota, M. 2015. Microporous Activated Carbon from KOH-Activation of Rubber Seed-Shells for Application in Capacitor Electrode. *Energy Procedia*. 79:651–656.

- Perdana, Yola Azli., Aziz, H., Emriadi. 2019. Effect of KOH Activator on the Performance of Activated Carbon from Oil Palm Kernel Shell as Supercapacitor Electrode Material. *J. Aceh Phys.Soc.*
- Philipp, Konnerth., Dennis, Jung., Jan, W. Straten., Klaus, Raffelt., Andrea, Kruse. 2021. Metal oxide-doped activated carbons from bakery waste and coffeegrounds for application in supercapacitors. *Materials Science for Energy Technologies*. 4 : 69-80.
- R. L. Tseng, S. K. Tseng, F. C. Wu C. C. Hu, C. C. Wang, J. Chin. Institute. Chem. Engineers, 39 (2008) 37–47.
- Ra E J., Raymundo-Piñero E., Lee Y H and Béguin F. 2009. *Carbon*. 47 : 2984.
- Rajasekaran, Sofia Jeniffer., Raghavan, Vimala. 2020. Facile synthesis of activated carbon derived from Eucalyptus globulus seed as efficient electrode material for supercapacitors. *Diamond & Related Materials*. 109 : 108038.
- Riyanto, Agus. 2014. Superkapasitor sebagai Piranti Penyimpan Energi Listrik Masa Depan. *Jurnal Ilmiah Pendidikan Fisika Al-Birun*. 3(2) : 153-159.
- S, Chen., J, Zhu., X, Wu., Q, Han., X, Wang. 2010. Graphene oxide–MnO₂ nanocomposites for supercapacitors. *ACS Nano*. 4 : 2822–2830.
- S, Li., K, Han., P, Si., J, Li., C, Lu. 2018. High-performance activated carbons prepared by KOH activation of gulfweed for supercapacitors. *Int. J. Electrochem. Sci.* 13 : 1728–1743.
- S, Sankar., A. Talha., A. Ahmed., A.I. Inamdar., H. Im., Y. Bin., Y. Lee., D. Young., S. Lee. 2019. Biomass-derived ultrathin mesoporous graphitic carbon nano flakes as stable electrode material for high-performance supercapacitors. *Mater. Des.* 169 : 107688.
- Sangeeta, Rawal, Bhawana, Joshi., Yogesh, Khumar. 2018. Synthesis and characterization of activated carbon from the biomass of *Saccharum bengalense* for electrochemical supercapacitors. *Journal of Energy Storage*. 20418-426.
- Satish R, Aravin V, Ling W C, Woei N K and Madhavi S. 2015. *Electrochim. Acta*. 182 474.

- Siti, Z., Aris, W., Nur, H., Apriza, M., Yoga, A. P., Lutfi, N., Novita, D. 2015. Analisis Luas Permukaan Zeolit Alam Termodifikasi Dengan Metode BET Menggunakan Surface Area Analyzer (SAA). Dalam Pelatihan Instrumen Jurusan Kimia FMIPA Universitas Negeri Semarang, Semarang.
- Stoller MD., Ruoff RS. 2010. Best practice methods for determining an electrode material's performance for ultracapacitors. *Energy Environ Sci.* 3 : 1294 – 1301.
- Su X., Li S., Jiang S., Peng Z., Guan X., Zheng X. 2018. Superior capacitive behavior of porous activated carbon tubes derived from biomass waste-cotonier strobili fibers. *Adv Powder Technol.* 29 : 2097 – 2107.
- Taer, E., Deraman, M., Talib, I.A., Awitdrus, A., Hashmi, S.A., Umar, A.A. 2011. Preparation of a Highly Porous Binderless Activated Carbon Monolith from Rubber Wood Sawdust by a Multi-Step Activation Process for Application in Supercapacitors. *Int. J. Electrochem. Sci.* 6 : 3301-3315.
- Taer, E., Taslim, R., Sugianto., Paiszal, M., Mukhlis., Mustika, W.S., Agustino. 2018. Meso- and Microporous Carbon Electrode and Its Effect on the Capacitive, Energy and Power Properties of Supercapacitor. *International Journal of Power Electronics and Drive System (IJPEDS)*. vol. 9, pp.1263-1271.
- Taer, E., et al. 2018. The relationship of surface area to cell capacitance for monolith carbon electrode from biomass materials for supercapacitor application. *International Conference on Science and Technology*. Series 1116.
- Taer, E., A. Afrianda, R. Taslim, Krisman, Minarni, A. Agustino, U. Malik, A. Apriwandi. 2018. *J. Phys. Conf. Ser.* 1120 : 012007.
- Taer, E., Apriwandi, R. Handayani, R. Taslim, Awitdrus, A. Amri, Agustino, I. Iwantono. 2019. The Synthesis of Bridging Carbon Particles with Carbon Nanotubes from Areca catechu Husk Waste as Supercapacitor Electrodes. *Int. J. Electrochem. Sci.* 14 : 9436–9448.
- Taer, E., A, Agustino., A, Awitdrus., R, Farma., R, Taslim. 2020. The Synthesis of Carbon Nanofiber Derived From Pineapple Leaf Fibers as a Carbon

- Electrode for Supercapacitor Application. *Journal of Electrochemical Energy Conversion and Storage*. Vol. 18 / 031004-1.
- Taer, E., Agrandi, Purnama., Apriwandi., Agustino., Rika, Taslim., Widya, Sinta Mustika. 2019. An Optimization Method to Determine Optimum Carbonization Temperature of Banana Stems Based Activated Carbon for Supercapacitors. *Materials Science and Engineering*. 599 : 012030.
- Taer, E., A, Apriwandi., Y, S. Ningsih., R, Taslim., Agustino. 2019. Preparation of Activated Carbon Electrode from Pineapple Crown Waste for Supercapacitor Application. *International Journal of Electrochemical Science*. 2462 – 2475.
- Taer, E., Taslim R., Mustika W S., Kurniasih B., Agustino., Afrianda A and Apriwandi. 2018. *Int. J. Electrochem. Sci.* 138428
- Taer, E., Rika, Taslim., Apriwandi., Agustino. 2020. Carbon nanofiber electrode synthesis from biomass materials for supercapacitor applications. *2nd International Conference and Exhibition on Powder Technology*. 2219, 020001-1–020001-7.
- Taer, E., R, Taslim., W, S Mustika., S, Nurjannah., R I Yani., Y. P Sari. 2019. Preparation of Mission Grass Flower-Based Activated Carbon Monolith Electrode for Supercapacitor Application. *Int. J. Electrochem. Sci.*, 14 : 7317-7331.
- Taer, E., Kristin Natalia., Apriwandi., Rika Taslim., Agustino., Rakhmawati Farma. 2020. The synthesis of activated carbon nanofiber electrode made from acacia leaves (*Acacia mangium* wild) as supercapacitors. *Vietnam Academy of Science and Technology*. 11 : 025007.
- Thambidurai A, Lourdusamy J K, John J V and Ganesan S. 2014. *Korean J. Chem. Eng.* 31 : 268
- T, E. Rufford., D, Hulicova-Jurcakova., Z, Zhu., G, Q. Lu. 2008. Nanoporous carbon electrode from waste coffee beans for high performance supercapacitors. *Electrochim. Commun.* 10 : 1594–1597.
- T, E. Rufford., D, Hulicova-Jurcakova., Z, Zhu., G, Q. Lu. 2009. Empirical analysis of the contributions of mesopores and micropores to the double-layer capacitance of carbons. *J. Phys. Chem. C*. 113 : 19335–19343.

- U, Patil., S, Kulkarni., V, Jamadade., C, Lokhande. 2011. Chemically synthesized hydroous RuO₂ thin films for supercapacitor application. *J. Alloys Compd.* 509 : 1677–1682.
- W, Gu., G, Yushin. 2013. Review of nanostructured carbon materials for electrochemical capacitor applications: advantages and limitations of activated carbon, carbide- derived carbon, zeolite-templated carbon, carbon aerogels, carbon nanotubes, onion-like carbon, and grapheme. *WIRE Energy Environ.* 3 : 424–473.
- W. S. K. Sing, H. D. Everett, W. A. R. Haul, L. Moscou, A. R. Pierotti, J. Rouquerol, T. Siemieniewska. 1985. *Pure & App. Chem.* 57 : 603.
- Wang, L., Huang, M., Chen, S., Kang, L., He, X., Lei, Z., et al. 2017. δ-MnO₂ nanofiber/single-walled carbon nanotube hybrid film for all-solid-state flexible supercapacitors with high performance. *Journal of Materials Chemistry A.* 5 : 19107-15.
- Wang Y., Qu Q., Gao S., Tang G., Liu K., He S., Huang C. 2019. Biomass derived carbon as binder-free electrode materials for supercapacitors. *Carbon.* 155 : 706–726.
- Wei H., Wang H., Li A., Li H., Cui D., Dong M. 2020. Advanced porous hierarchical activated carbon derived from agricultural wastes toward high performance supercapacitors. *J Alloys Compd.* 820 : 153111.
- X, Gao., W, Xing., J, Zhou., G, Wang., S, Zhuo., Z, Liu., Q, Xue., Z, Yan. 2014. Superior capacitive performance of active carbons derived from Enteromorpha prolifera. *Electrochimica Acta.* 133 : 459–466.
- X, Zhao., L, Wei., J, Julson., Z, Gu., Y, Cao. 2015. Catalytic cracking of inedible camelina oils to hydrocarbon fuels over bifunctional Zn/ZSM-5 catalysts. *Korean Journal of Chemical Engineering.* 32 : 1528–1541.
- X, Zhao., L, Wei., S, Cheng., Y, Cao., J, Julson., Z, Gu. 2015. Catalytic cracking of carinata oil for hydrocarbon biofuel over fresh and regenerated Zn/Na-ZSM-5. *Applied Catalysis A: General.* 507 : 44–55.
- X. Wei, J. Wei, Y. Li, H. Zou, Robust hierarchically interconnected porous carbons derived from discarded *Rhus typhina* fruits for ultrahigh capacitive performance supercapacitors, *J. Power Sources.* 414 (2019) 13–23.

- X. Wu, X. Hong, Z. Luo, K.S. Hui, H. Chen, J. Wu, K.N. Hui, L. Li, J. Nan, Q. Zhang. 2013. *Electrochim. Acta.* 89 : 400.
- Xi, Lin Wu and An, Wu Xu. 2014. Carbonaceous hydrogels and aerogels for supercapacitors. *Journal of Materials Chemistry A.* 2 : 4852–4864.
- Yadav, N., Ritu, Promila, Hashmi, S.A. 2020. Hierarchical porous carbon derived from eucalyptus bark as sustainable electrodes for highperformance solid-state supercapacitor. *Sustainable Energy Fuels.* 1 : 1-35.
- Yahya, MA., Al-qodah Z., Ngah CWZ. 2015. Agricultural biowaste materials as potential sustainable precursors used for activated carbon production. A review. *Renew Sustain Energy Rev.* 46 : 218–235.
- Yin, Lihong., Chen, Yong. 2016. 3-Dimensional hierarchical porous actived carbon derived from coconut fibers with high-rate performance for symmetric supercapacitors. *Material and Design.* 111 : 44-50
- Yuhe, Cao., Keliang, Wang., et al. 2016. Hierarchical porous activated carbon for supercapacitor derived from corn stalk core by potassium hydroxide activation. *Electrochimica Acta.* 212 : 839-847.
- Zhao C., Huang Y., Shao X., Zhu Z. 2018. Rose-derived 3D carbon nanosheets for high cyclability and extended voltage supercapacitors. *Electrochim Acta.* 291 : 287 – 296.
- Zhao N., Zhang P., Luo D., Xiao W., Deng L. 2019. Direct production of porous carbon nanosheets/particle composites from wasted litchi shell for supercapacitors. *J Alloys Compd.* 788 : 677– 684.