

DAFTAR PUSTAKA

1. Sun L, Niu D, Wang K, Xu X. Sustainable Development Pathways of Hydropower in China: Interdisciplinary Qualitative Analysis and Scenario-based System Dynamics Quantitative Modeling. *Elsevier Ltd*. 2021;
2. Majid, S., Ali ASG, Cao WQ, Reza R, Ge Q. Biomass-derived porous carbons as supercapacitor electrodes-A review. In Xinxing Tan Cailiao/New Carbon Materials. *Inst Met Res Chinese Acad Sci*. 2021;36(3):546–72.
3. Yang L, Qiu J, Wang Y, Guo S, Feng Y, Dong D, et al. Molten salt synthesis of hierarchical porous carbon from wood sawdust for supercapacitors. *J Electroanal Chem*. 2020;856.
4. Wu C, Yang S, Cai J, Zhang Q, Zhu Y, Zhang K. Activated Microporous Carbon Derived from Almond Shells for High Energy Density Asymmetric Supercapacitors. *ACS Appl Mater Interfaces*. 2016;8:15288–15296.
5. Aziz H, Tetra ON, A. A, Syukri., Ramadhan W. Electrical Properties of Supercapacitor Electrode - Based on Activated Carbon from Waste Palm Kernel Shells. *Der Pharma Chem*. 2016;8(15):227–32.
6. Shen H, Xia X, Ouyang Y, Jiao X, Mutahir S, Mandler D, et al. Preparation of Biomass-Based Porous Carbons with High Specific Capacitance for Applications in Supercapacitors. *ChemElectroChem*. 2019;6:3599–3605.
7. Tetra ON, Aziz H, Emriadi., Hanif W, Admin A. Performance of TiO₂- Carbon on Ceramic Template with Sodium Hydroxide Activation as Supercapacitor Electrode Materials. *Der Pharma Chem*. 2016;8(17):26–30.
8. Ghosh S, Santhosh R, Jeniffer S, Raghavan V, Jacob G, Nanaji K, et al. Natural biomass derived hard carbon and activated carbons as electrochemical supercapacitor electrodes. *Sci Rep*. 2019;9.
9. Yuan X, Xiao J, Yilmaz M, Zhang C, Yuan S. N, P Co-doped porous biochar derived from cornstalk for high performance CO₂ adsorption and electrochemical energy storage. *Sep Purif Technol*. 2022;299.
10. Safaryanti S., Rahmalia W, Shofiyani A, Et A. Sintesis dan Karakteristik Karbon Aktif Dari Tempurung Buah Nipah (*Nypa fruticans*) Menggunakan Aktivator Asam Klorida. *J Kim Khatulistiwa*. 2018;7(2):41–6.
11. Ukkakimapan P, Sattayarut V, Wanchaem T, Yordsri V, Phonyiem M, Ichikawa S, et al. Preparation of activated carbon via acidic dehydration of durian husk for supercapacitor applications. *Diam Relat Mater*. 2020;107.
12. Isahak WNRW, Hisham MWM, Yarmo MA. Highly porous carbon materials from biomass by chemical and carbonization method: A comparison study. *J Chem*. 2013;2013(1).
13. Harry Marsh, F R-R. Activation Processes (Chemical). 2006;
14. Zhang Y, Yu S, Lou G, Shen Y, Chen H, Shen Z, et al. Review of Macroporous Materials as Electrochemical Supercapacitor Electrodes. *J Mater Sci*. 2017;52(19):11201–28.
15. Joshi PS, Sutrave DS. Supercapacitor: Basics and Overview. *J Inf Comput Sci*. 2019;9(12):609–25.
16. Latham KG, Forghani M, Dose WM, Allen JA, Donne SW. Influence of counter ions of ammonium for nitrogen doping and carbon properties in hydrothermal carbonization: Characterization and supercapacitor performance. *Mater Adv*. 2021;2(1):384–97.

17. Rustamaji H, Prakoso T, Devianto H, Widiatmoko P, Saputera WH. Urea Nitrogenated Mesoporous Activated Carbon Derived from Oil Palm Empty Fruit Bunch for High-Performance Supercapacitor. *J Energy Storage*. 2022;52.
18. Lien YC, Lai SJ, Lin CY, Wong KP, Chang MS, Wu SH. High-efficiency decomposition of eggshell membrane by a keratinase from *Meiothermus taiwanensis*. *Sci Rep.* 2022;12(1):1–11. Available from: <https://doi.org/10.1038/s41598-022-18474-4>
19. Tetra ON. Sintesis Dan Karakterisasi Elektroda Superkapasitor Ramah Lingkungan Dari Karbon Aktif N-Doped Berbasis Batang Jagung (*Zea Mays.L*) Melalui Metode Dehidrasi. 2024.
20. Riyanto A. Supercapacitor Sebagai Piranti Penyimpanan Energi Listrik Masa Depan. *J Ilm Pendidik Fis A-L-BiRuNi*. 2014;3(2).
21. Dong K. Based on the form of new energy, the development prospect of supercapacitors in electric vehicles is discussed. *E3S Web Conf.* 2025;606:1–7.
22. Iqbal MF, Nasir F, Shabbir F, Babar ZUD, Saleem MF, Ullah K, et al. Supercapacitors: An Emerging Energy Storage System. *Adv Energy Sustain Res.* 2025;2400412.
23. Lakshmi SD, Avti PK, Hegde G, Et A. Activated carbon nanoparticles from biowaste as new generation antimicrobial agents: A review. *Nano-Structures and Nano-Objects*. 2018;16:306–21.
24. Reimer C, Snowdon MR, Vivekanandhan S, You X, Misra M, Gregori S, et al. Synthesis and characterization of novel nitrogen doped biocarbons from distillers dried grains with solubles (DDGS) for supercapacitor applications. *Bioresour Technol Reports*. 2020;9.
25. Jiang G, Senthil RA, Sun Y, Kumar TR, Pan J. Recent progress on porous carbon and its derivatives from plants as advanced electrode materials for supercapacitors. *J Power Sources*. 2022;520.
26. Fedoseeva Y v., Shlyakhova E v., Stolyarova SG, Vorfolomeeva AA, Nishchakova AD, Grebenkina MA, et al. Electrochemical Performance of Potassium Hydroxide and Ammonia Activated Porous Nitrogen-Doped Carbon in Sodium-Ion Batteries and Supercapacitors. *Inorganics*. 2022;10:198.
27. Istiqomah AU, Rahmawati F, Nugrahaningtyas KD. Replacing Soda Ash (NaOH) With Kalium Hydroxyde (KOH) In Destilation Of Binary Ethanol-Water Mixture. *ALCHEMY J Penelit Kim.* 2016;12(2):179.
28. Oyedotun KO, Barzegar F, Mirghni AA, Khaleed AA, Masikhwa TM, Manyala N. Examination of High-Porosity Activated Carbon Obtained from Dehydration of White Sugar for Electrochemical Capacitor Applications. *ACS Sustain Chem Eng.* 2019;7(1):537–46.
29. Liang X, Cong H, Jiang G, Rao RP, He H, Ramakrishna S. Eggshell membrane: Structure, purification, properties and multifunctional applications. *Food Biosci.* 2024;60(March).
30. Fachrully Septiano A, Erna Setyaningsih N. Analisis Citra Hasil Scanning Electron Microscopy Energy Dispersive X-Ray (SEM EDX) Komposit Resin Timbal dengan Metode Contrast to Noise Ratio (CNR). *Indones J Math Nat Sci.* 2021;44(2).
31. Unknown S, Chand P, Joshi A. Biomass derived carbon for supercapacitor applications: Review. *J Energy Storage*. 2021;39.
32. Wulan Sari N, Fajri M. Analisis Fitokimia Dan Gugus Fungsi Dari Ekstrak Etanol Pisang Goroho Merah (*Musa Acuminata* (L)). 2018. 2(1).
33. Dewa I, Subamia P, Widiasih N, Ayu G, Wahyuni NS, Lilik P, et al. Optimasi Kinerja Alat Fourier Transform Infrared (FTIR) Melaui Studi Perbandingan Komposisi dan Ketebalan

- Sampel-KBr. *J Pengelolaan Lab Pendidik.* 5(2).
34. Marlina J, Nasution R, Kimia SJ, Matematika F, Ilmu D, Alam P. No Title Applying SEM-EDX Techniques To Identifying The Types Of Mineral Of Jades (Giok) Takengon, Aceh. *J Nat.* 2015;15(2).
 35. Hendri Iyabu II. Biokonversi Limbah Tongkol Jagung Menjadi Bioetanol Sebagai Bahan Bakar Alternatif terbarukan. *Jambura J Chem.* 2019;42–9.
 36. Sahdiah H, Kurniawan R. Optimasi Tegangan Akselerasi pada Scanning Electron Microscope – Energy Dispersive X-Ray Spectroscopy (SEM-EDX) untuk Pengamatan Morfologi Sampel Biologi. *J Sains Dan Edukasi Sains.* 2023;6(2):117–23.
 37. Waltrip B, Avramov-Zamurovic S, Koffman A. Inductance measurement using an LCR meter and a current transformer interface. *Conf Rec - IEEE Instrum Meas Technol Conf.* 2005;2:1005–7.
 38. Litch F, Davis, M A, Andreas, H A. harge redistribution and electrode history impact galvanostatic charging/discharging and associated figures of merit. *J Power Sources.* 2020;446(227354).
 39. Aiping Y, Victor C, Jiujun Z. Electrochemical Supercapacitors for Energy Storage and Delivery: Fundamentals and Applications. *CRC Press Taylor Fr Gr.* 2014;
 40. Novitra. R. Superkapasitor Berbahan Dasar Karbon Aktif dari Ampas Biji Kopi Robusta Dengan Aktivator NaOH. Tesis. Padang. FMIPA, Universitas Andalas. 2021.
 41. Farma R, Apriyani I, Awitdrus, Deraman M, Taer E, Setiadi R, et al. Enhanced electrochemical performance of oxygen, nitrogen, and sulfur trial-doped Nypa fruticans-based carbon nanofiber for high performance supercapacitors. *J Energy Storage.* 2023;67(February).
 42. Yu K, Zhu H, Qi H, Liang C. High Surface Area Carbon Materials Derived from Corn Stalk Core as Electrode for Supercapacitor. *Diam Relat Mater.* 2018;88:12–22.
 43. Yang X, Wang Q, Lai J, Cai Z, Lv J, Chen X, et al. Nitrogen-Doped Activated Carbons via Melamine-Assisted NaOH/KOH/Urea Aqueous System for High Performance Supercapacitors. *Mater Chem Phys.* 2020;250.
 44. Karakehya N. Effects of One-Step and Two-Step KOH Activation Method on the Properties and Supercapacitor Performance of Highly Porous Activated Carbons Prepared from Lycopodium Clavatum Spores. 2023;
 45. Shaku B, Mofokeng TP, Coville NJ, Ozoemena KI, Maubane-Nkadimeng MS. Biomass valorisation of marula nutshell waste into nitrogen-doped activated carbon for use in high performance supercapacitors. *Electrochim Acta.* 2023;442(January):141828. Available from: <https://doi.org/10.1016/j.electacta.2023.141828>
 46. Zhao J, Syed J, Wen X, Et A. Green synthesis of FeS anchored carbon fibers using eggshell membrane as a bio-template for energy storage application. *J Alloy Compd.* 2018;777.
 47. Kurniawan RY, Dwi I, Kurniawan O, Atmaja L, Widiastuti N. Synthesis N- Doped Activated Carbon from Sugarcane Bagasse for CO 2 Adsorption. *IPTEK J Technol Sci.* 2019;30(3):80.
 48. Nnorom, O., Onuegbu G. Authentication of Rothmannia Whitfieldii Dye Extract with FTIR Spectroscopy. 2019;5(02):38–47.
 49. Bilal M, Li J, Landskron K. Activated Carbon Electrodes with Improved Sorption Capacity for Supercapacitive Swing Adsorption of Carbon Dioxide.
 50. Gao X, Chen Y, Kang Z, Wang B, Du W. Enhanced degradation of aqueous tetracycline

hydrochloride by integrating eggshell-derived CaCO₃/CuS nanocomposite with advanced oxidation process. *Mol Catal.* 2021;501.

51. Boyjoo Y, Cheng Y, Zhong H, Tian H, Pan J, Pareek VK, et al. From Waste Coca Cola® to Activated Carbons with Impressive Capabilities for CO₂ Adsorption and Supercapacitors. *Carbon N Y.* 2017;116:490–9.
52. Boujibar O, Ghosh A, Achak O, Chafik T, Ghamouss F. A High Energy Storage Supercapacitor Based on Nanoporous Activated Carbon Electrode Made from Argan Shells with Excellent Ion Transport in Aqueous and Non- Aqueous Electrolytes. *J Energy Storage.* 2019;26.
53. Thommes M, Kaneko K, Neimark A V., Olivier JP, Rodriguez-Reinoso F, Rouquerol J, et al. Physisorption of Gases, with Special Reference to the Evaluation of Surface Area and Pore Size Distribution (IUPAC Technical Report). *Pure Appl Chem.* 2015;87(09–10):1051–69.
54. Sotomayor F, Quantatec AP, Sotomayor FJ, Cychosz KA, Thommes M. Characterization of Micro/Mesoporous Materials by Physisorption: Concepts and Case Studies. 2018;3.
55. Azman NHN, Sulaiman Y. Hierarchical Porous Materials for Supercapacitors. *Encycl Energy Storage.* 2022;622–37.
56. Chairunnisa Npy. Pemanfaatan Karbon Aktif Doping N Dari Batang Jagung (*Zea Mays L.*) Dengan Aktivator Koh Sebagai Elektroda Superkapasitor. Vol. 15, *Ayan.* 2024.
57. Wang Y, Li H, Yang W, Jian S, Zhang C, Duan G. One step activation by ammonium chloride toward N-doped porous carbon from camellia oleifera for supercapacitor with high specific capacitance and rate capability. *Diam Relat Mater.* 2022;130.
58. Jiang X, Guo F, Jia X, Zhan Y, Zhou H, Qian L. Synthesis of Nitrogen- Doped Hierarchical Porous Carbons from Peanut Shell as a Promising Electrode Material for High-Performance Supercapacitors. *J Energy Storage.* 2020;30.
59. Ardynah B, Taer E, Djafar Z, Piarah WH, Tahir D. Effect of Temperature on Physical and Electrochemical Properties of the Monolithic Carbon-Based Bamboo Leaf to Enhanced Surface Area and Specific Capacitance of the Supercapacitor. *Int J Electrochem Sci.* 2019;14(8):7076–87.
60. El-Nemr MA, Hassaan MA, Ashour I. Fabrication of N-Doping Activated Carbons from Fish Waste and Sawdust for Acid Yellow 36 Dye Removal from an Aquatic Environment. *Sci Rep.* 2023;13(1).
61. Nasir S, Hussein MZ, Zainal Z, Yusof NA, Zobir SAM. Electrochemical Energy Storage Potentials of Waste Biomass: Oil Palm Leaf- And Palm Kernel Shell-Derived Activated Carbons. *Energies (Basel).* 2018;11(12).
62. Nurul Huda A, Lestari I, Hidayat S. Pemanfaatan Karbon Aktif Dari Sekam Padi Sebagai Elektroda Superkapasitor. *J Ilmu dan Inov Fis.* 2022;06(02):102–13.
63. Apriwandi A, Taer E, Farma R. Analysis of Cyclic Voltammetry Dan Galvanostatic Charge Discharge Electrode Supercapacitor Based on Activated Carbon from Kepok Banana Leaf (*Musa Balbisiana*). *J Aceh Phys Soc.* 2021;10(4):94–101.
64. Tran Thi Dieu H, Charoensook K, Tai HC, Lin YT, Li YY. Tran Thi Dieu, H., Charoensook, K., Tai, H. C., Lin, Y. T., Li, Y. Y. 2021. Preparation of Activated Carbon Derived from Oil Palm Empty Fruit Bunches and Its Modification by Nitrogen Doping for Supercapacitors. *J Porous Mater.* 2021;28(1):9–18.