



## DAFTAR PUSTAKA

- Abatyough, M. T., Ajibola, V. O., Agbaji, E. B., & Yashim, Z. I. (2022). Properties of Upgraded Bio-oil from Pyrolysis of Waste Corn Cobs. *Journal of Sustainability and Environmental Management*, 1(2), 120–128. <https://doi.org/10.3126/josem.v1i2.45348>
- Alothman, Z. A. (2012). A review: Fundamental aspects of silicate mesoporous materials. *Materials*, 5(12), 2874–2902. <https://doi.org/10.3390/ma5122874>
- Arenas, C. N., Navarro, M. V., & Martínez, J. D. (2019). Pyrolysis kinetics of biomass wastes using isoconversional methods and the distributed activation energy model. *Bioresource Technology*, 288, 121485. <https://doi.org/10.1016/j.biortech.2019.121485>
- Arenas Castiblanco, E., Montoya, J. H., Rincón, G. V., Zapata-Benabithe, Z., Gómez-Vásquez, R., & Camargo-Trillo, D. A. (2022). A new approach to obtain kinetic parameters of corn cob pyrolysis catalyzed with CaO and CaCO<sub>3</sub>. *Heliyon*, 8(8). <https://doi.org/10.1016/j.heliyon.2022.e10195>
- Arshad, H., Sulaiman, S. A., Hussain, Z., Naz, Y., & Basrawi, F. (2017). Microwave assisted pyrolysis of plastic waste for production of fuels: A review. *MATEC Web of Conferences*, 131. <https://doi.org/10.1051/matecconf/201713102005>
- Barontini, F., Biagini, E., Bonini, F., & Tognotti, L. (2015). An experimental investigation on the devolatilization behaviour of raw and torrefied lignocellulosic biofuels. *Chemical Engineering Transactions*, 43, 481–486. <https://doi.org/10.3303/CET1543081>
- Bhatia, S. K., Jagtap, S. S., Bedekar, A. A., Bhatia, R. K., Patel, A. K., Pant, D., Rajesh Banu, J., Rao, C. V., Kim, Y. G., & Yang, Y. H. (2020). Recent developments in pretreatment technologies on lignocellulosic biomass: Effect of key parameters, technological improvements, and challenges. *Bioresource Technology*, 300(January), 122724. <https://doi.org/10.1016/j.biortech.2019.122724>
- Biswas, B., Pandey, N., Bisht, Y., Singh, R., Kumar, J., & Bhaskar, T. (2017). Pyrolysis of agricultural biomass residues: Comparative study of corn cob, wheat straw, rice straw and rice husk. *Bioresource Technology*, 237, 57–63. <https://doi.org/10.1016/j.biortech.2017.02.046>
- Bridgwater, A. V. (2012). Review of fast pyrolysis of biomass and product upgrading. *Biomass and Bioenergy*, 38, 68–94. <https://doi.org/10.1016/j.biombioe.2011.01.048>
- Capodaglio, A. G., & Bolognesi, S. (2019). Ecofuel feedstocks and their prospects. In *Advances in Eco-Fuels for a Sustainable Environment*. Elsevier Ltd. <https://doi.org/10.1016/b978-0-08-102728-8.00002-4>
- Da Costa Lopes, A. M., & Bogel-Lukasik, R. (2015). Acidic ionic liquids as sustainable approach of cellulose and lignocellulosic biomass conversion without additional catalysts. *ChemSusChem*, 8(6), 947–965. <https://doi.org/10.1002/cssc.201402950>
- Dai, L., Zeng, Z., Tian, X., Jiang, L., Yu, Z., Wu, Q., Wang, Y., Liu, Y., & Ruan, R. (2019). Microwave-assisted catalytic pyrolysis of torrefied corn cob for phenol-rich bio-oil production over Fe modified bio-char catalyst. *Journal of Analytical and Applied Pyrolysis*, 137, 104520. <https://doi.org/10.1016/j.jaap.2019.104520>



*Pyrolysis*, 143(September), 104691. <https://doi.org/10.1016/j.jaap.2019.104691>

- Dewayanto, N., & Nordin, M. R. (2016). Catalytic Pyrolysis of Biomass to Synthesize Bio-oil and Chemicals: A Review. *CHEMICA: Jurnal Teknik Kimia*, 2(1), 29. <https://doi.org/10.26555/chemica.v2i1.4566>
- Dhanashree D. Wagh, Omprakash K. Mahadwad, & Prasad L. Kokil. (2016). Formation, Analysis and Characterization of Mixed Wood Pyrolysed Oil. *International Journal of Engineering Research And*, V5(05), 274–279. <https://doi.org/10.17577/ijertv5is050377>
- Dickerson, T., & Soria, J. (2013). Catalytic fast pyrolysis: A review. *Energies*, 6(1), 514–538. <https://doi.org/10.3390/en6010514>
- Din, M. I., Sadaf, S., Hussain, Z., & Khalid, R. (2020). Assembly of superparamagnetic iron oxide nanoparticles (Fe<sub>3</sub>O<sub>4</sub>-Nps) for catalytic pyrolysis of corn cob biomass. *Energy Sources, Part A: Recovery, Utilization and Environmental Effects*, 00(00), 1–9. <https://doi.org/10.1080/15567036.2020.1767235>
- El-Sayed, S. A., & Khairy, M. (2015). Effect of heating rate on the chemical kinetics of different biomass pyrolysis materials. *Biofuels*, 6(3–4), 157–170. <https://doi.org/10.1080/17597269.2015.1065590>
- Eseyin, A. E., & Steele, P. H. (2015). An overview of the applications of furfural and its derivatives. *International Journal of Advanced Chemistry*, 3(2), 42. <https://doi.org/10.14419/ijac.v3i2.5048>
- Fahmy, T. Y. A., Fahmy, Y., Mobarak, F., El-Sakhawy, M., & Abou-Zeid, R. E. (2020). Biomass pyrolysis: past, present, and future. *Environment, Development and Sustainability*, 22(1), 17–32. <https://doi.org/10.1007/s10668-018-0200-5>
- Fan, L., Chen, P., Zhou, N., Liu, S., Zhang, Y., Liu, Y., Wang, Y., Omar, M. M., Peng, P., Addy, M., Cheng, Y., & Ruan, R. (2018). In-situ and ex-situ catalytic upgrading of vapors from microwave-assisted pyrolysis of lignin. *Bioresource Technology*, 247, 851–858. <https://doi.org/10.1016/j.biortech.2017.09.200>
- Fang, M. X., Shen, D. K., Li, Y. X., Yu, C. J., Luo, Z. Y., & Cen, K. F. (2006). Kinetic study on pyrolysis and combustion of wood under different oxygen concentrations by using TG-FTIR analysis. *Journal of Analytical and Applied Pyrolysis*, 77(1), 22–27. <https://doi.org/10.1016/j.jaap.2005.12.010>
- Foong, S. Y., Liew, R. K., Yang, Y., Cheng, Y. W., Yek, P. N. Y., Wan Mahari, W. A., Lee, X. Y., Han, C. S., Vo, D. V. N., Van Le, Q., Aghbashilo, M., Tabatabaei, M., Sonne, C., Peng, W., & Lam, S. S. (2020). Valorization of biomass waste to engineered activated biochar by microwave pyrolysis: Progress, challenges, and future directions. *Chemical Engineering Journal*, 389(February), 124401. <https://doi.org/10.1016/j.cej.2020.124401>
- French, R., & Czernik, S. (2010). Catalytic pyrolysis of biomass for biofuels production. *Fuel Processing Technology*, 91(1), 25–32. <https://doi.org/10.1016/j.fuproc.2009.08.011>
- Gai, C., Dong, Y., & Zhang, T. (2013). The kinetic analysis of the pyrolysis of agricultural residue under non-isothermal conditions. *Bioresource Technology*, 127, 298–305.



- Gamlie, D. P., Du, S., Bollas, G. M., & Valla, J. A. (2015). Investigation of in situ and ex situ catalytic pyrolysis of miscanthus × giganteus using a PyGC-MS microsystem and comparison with a bench-scale spouted-bed reactor. *Bioresource Technology*, 191, 187–196. <https://doi.org/10.1016/j.biortech.2015.04.129>
- Gupta, S., Lanjewar, R., & Mondal, P. (2022). Enhancement of hydrocarbons and phenols in catalytic pyrolysis bio-oil by employing aluminum hydroxide nanoparticle based spent adsorbent derived catalysts. *Chemosphere*, 287(P3), 132220. <https://doi.org/10.1016/j.chemosphere.2021.132220>
- Han, Y., Gholizadeh, M., Tran, C. C., Kaliaguine, S., Li, C. Z., Olarte, M., & Garcia-Perez, M. (2019). Hydrotreatment of pyrolysis bio-oil: A review. *Fuel Processing Technology*, 195(May). <https://doi.org/10.1016/j.fuproc.2019.106140>
- Hu, M., Cui, B., Xiao, B., Luo, S., & Guo, D. (2020). Insight into the ex situ catalytic pyrolysis of biomass over char supported metals catalyst: Syngas production and tar decomposition. *Nanomaterials*, 10(7), 1–14. <https://doi.org/10.3390/nano10071397>
- Huang, C., Lin, W., Lai, C., Li, X., Jin, Y., & Yong, Q. (2019). Coupling the post-extraction process to remove residual lignin and alter the recalcitrant structures for improving the enzymatic digestibility of acid-pretreated bamboo residues. *Bioresource Technology*, 285(April), 121355. <https://doi.org/10.1016/j.biortech.2019.121355>
- Huo, X., Xiao, J., Song, M., & Zhu, L. (2018). Comparison between in-situ and ex-situ catalytic pyrolysis of sawdust for gas production. *Journal of Analytical and Applied Pyrolysis*, 135, 189–198. <https://doi.org/10.1016/j.jaat.2018.09.003>
- Imran, A., Bramer, E. A., Seshan, K., & Brem, G. (2018). An overview of catalysts in biomass pyrolysis for production of biofuels. *Biofuel Research Journal*, 5(4), 872–885. <https://doi.org/10.18331/BRJ2018.5.4.2>
- Iskandar, T. (2012). Jagung Dan Sekam Padi Pada Proses Pirolisis Identification Value of Heat Biochar From Cob and. *Jurusan Teknik Kimia*, 7, 32–35.
- Jensen, C. U., Rodriguez Guerrero, J. K., Karatzos, S., Olofsson, G., & Iversen, S. B. (2017). Fundamentals of Hydrofaction<sup>TM</sup>: Renewable crude oil from woody biomass. *Biomass Conversion and Biorefinery*, 7(4), 495–509. <https://doi.org/10.1007/s13399-017-0248-8>
- Kan, T., Strezov, V., Evans, T., He, J., Kumar, R., & Lu, Q. (2020). Catalytic pyrolysis of lignocellulosic biomass: A review of variations in process factors and system structure. *Renewable and Sustainable Energy Reviews*, 134(July), 110305. <https://doi.org/10.1016/j.rser.2020.110305>
- Kan, T., Strezov, V., & Evans, T. J. (2016). Lignocellulosic biomass pyrolysis: A review of product properties and effects of pyrolysis parameters. *Renewable and Sustainable Energy Reviews*, 57, 1126–1140. <https://doi.org/10.1016/j.rser.2015.12.185>
- Kanani, N., & Rusdi. (2019). Effect OF FeCl<sub>3</sub> and Al<sub>2</sub>O<sub>3</sub> Addition Toward Lignin Content on Corn Cob Delignification with NaOH as the Solvent by using Ultra Sonic Assisted.



- Kim, J. S. (2015). Production, separation and applications of phenolic-rich bio-oil - A review. *Bioresource Technology*, 178, 90–98. <https://doi.org/10.1016/j.biortech.2014.08.121>
- Kim, Y.-M., Rhee, G. H., Ko, C. H., Kim, K. H., Jung, K. Y., Kim, J. M., & Park, Y.-K. (2018). Catalytic Pyrolysis of Pinus densiflora Over Mesoporous Al<sub>2</sub>O<sub>3</sub> Catalysts . *Journal of Nanoscience and Nanotechnology*, 18(9), 6300–6303. <https://doi.org/10.1166/jnn.2018.15653>
- Lestari, D. Y. (2012). *PEMILIHAN KATALIS YANG IDEAL Dewi Yuanita Lestari Jurusan Pendidikan Kimia FMIPA UNY*. 53–58.
- Liang, S., Guo, F., Du, S., Tian, B., Dong, Y., Jia, X., & Qian, L. (2020). Synthesis of Sargassum char-supported Ni-Fe nanoparticles and its application in tar cracking during biomass pyrolysis. *Fuel*, 275(January), 117923. <https://doi.org/10.1016/j.fuel.2020.117923>
- Lim, J. S., Abdul Manan, Z., Wan Alwi, S. R., & Hashim, H. (2012). A review on utilisation of biomass from rice industry as a source of renewable energy. *Renewable and Sustainable Energy Reviews*, 16(5), 3084–3094. <https://doi.org/10.1016/j.rser.2012.02.051>
- Liu, S., Wu, G., Syed-Hassan, S. S. A., Li, B., Hu, X., Zhou, J., Huang, Y., Zhang, S., & Zhang, H. (2022). Catalytic pyrolysis of pine wood over char-supported Fe: Bio-oil upgrading and catalyst regeneration by CO<sub>2</sub>/H<sub>2</sub>O. *Fuel*, 307(August 2021), 121778. <https://doi.org/10.1016/j.fuel.2021.121778>
- Liu, X., Xia, W., Jiang, Q., Xu, Y., & Yu, P. (2014). Synthesis, characterization, and antimicrobial activity of kojic acid grafted chitosan oligosaccharide. *Journal of Agricultural and Food Chemistry*, 62(1), 297–303. <https://doi.org/10.1021/jf404026f>
- Llorente, M. J. F., & García, J. E. C. (2008). Suitability of thermo-chemical corrections for determining gross calorific value in biomass. *Thermochimica Acta*, 468(1–2), 101–107. <https://doi.org/10.1016/j.tca.2007.12.003>
- Lu, J. J., & Chen, W. H. (2014). Product yields and characteristics of corncob waste under various torrefaction atmospheres. *Energies*, 7(1), 13–27. <https://doi.org/10.3390/en7010013>
- Lucas, A. N. L., Schneider, J. K., Polidoro, A. S., & Pinho, A. R. (2023). *Quantitative GC-MS Analysis of Sawdust Bio-Oil*. 00(00), 1–11.
- Mariscal, R., Maireles-Torres, P., Ojeda, M., Sádaba, I., & López Granados, M. (2016). Furfural: A renewable and versatile platform molecule for the synthesis of chemicals and fuels. *Energy and Environmental Science*, 9(4), 1144–1189. <https://doi.org/10.1039/c5ee02666k>
- Minh Loy, A. C., Yusup, S., Fui Chin, B. L., Wai Gan, D. K., Shahbaz, M., Acda, M. N., Unrean, P., & Rianawati, E. (2018). Comparative study of in-situ catalytic pyrolysis of rice husk for syngas production: Kinetics modelling and product gas analysis. *Journal of Cleaner Production*, 197, 1231–1243. <https://doi.org/10.1016/j.jclepro.2018.06.245>



- Mishra, R. K., & Mohanty, K. (2018). Pyrolysis kinetics and thermal behavior of waste sawdust biomass using thermogravimetric analysis. *Bioresource Technology*, 251, 63–74. <https://doi.org/10.1016/j.biortech.2017.12.029>
- Mortensen, P. M., Grunwaldt, J. D., Jensen, P. A., Knudsen, K. G., & Jensen, A. D. (2011). A review of catalytic upgrading of bio-oil to engine fuels. *Applied Catalysis A: General*, 407(1–2), 1–19. <https://doi.org/10.1016/j.apcata.2011.08.046>
- Muangsuwan, C., Kripasertkul, W., Ratchahat, S., Liu, C. G., Posoknistakul, P., Laosiripojana, N., & Sakdaronnarong, C. (2021). Upgrading of Light Bio-oil from Solvothermolysis Liquefaction of an Oil Palm Empty Fruit Bunch in Glycerol by Catalytic Hydrodeoxygenation Using NiMo/Al<sub>2</sub>O<sub>3</sub>or CoMo/Al<sub>2</sub>O<sub>3</sub>Catalysts. *ACS Omega*, 6(4), 2999–3016. <https://doi.org/10.1021/acsomega.0c05387>
- Mulokozi, M., & Lugwisha, E. (1991). Influence of sample particle size and heating rate on the thermal decomposition of K<sub>2</sub>C<sub>2</sub>O<sub>4</sub>. *Journal of Thermal Analysis*, 37(3), 583–596. <https://doi.org/10.1007/BF01913110>
- Othman, S. (2020). Catalysts of the preparation and industrial importance of catalysis and catalyst deactivation. *Advanced Chemistry Research*, 1, 23–27.
- Parihar, A., & Bhattacharya, S. (2020). Cellulose fast pyrolysis for platform chemicals: assessment of potential targets and suitable reactor technology. *Biofuels, Bioproducts and Biorefining*, 14(2), 446–468. <https://doi.org/10.1002/bbb.2066>
- Pranoto, B., Pandin, M., Rahma Fithri, S., & Nasution, S. (2013). Biomass Potential Map As a Database of National Scale Biomass Energy Development. *Ketenagalistrikan Dan Energi Terbarukan*, 12(2), 123–130.
- Ringer, M., Putsche, V., & Scahill, J. (2006). Large-Scale Pyrolysis Oil Production and Economic Analysis. *Technical Report NREL/TP-510-37779, November*.
- Sarkar, J. K., & Wang, Q. (2020). Characterization of pyrolysis products and kinetic analysis of waste jute stick biomass. *Processes*, 8(7). <https://doi.org/10.3390/pr8070837>
- Shariff, A., Aziz, N. S. M., Ismail, N. I., & Abdullah, N. (2016). Corn cob as a potential feedstock for slow pyrolysis of biomass. *Journal of Physical Science*, 27(2), 123–137. <https://doi.org/10.21315/jps2016.27.2.9>
- Shen, Y., Zhao, P., Shao, Q., Ma, D., Takahashi, F., & Yoshikawa, K. (2014). In-situ catalytic conversion of tar using rice husk char-supported nickel-iron catalysts for biomass pyrolysis/gasification. *Applied Catalysis B: Environmental*, 152–153(1), 140–151. <https://doi.org/10.1016/j.apcatb.2014.01.032>
- Singh, S., & Sawarkar, A. N. (2020). Pyrolysis of corn cob: Physico-chemical characterization, thermal decomposition behavior and kinetic analysis. *Chemical Product and Process Modeling*, 16(2), 117–127. <https://doi.org/10.1515/cppm-2020-0048>
- Slopiecka, K., Bartocci, P., & Fantozzi, F. (2012). Thermogravimetric analysis and kinetic study of poplar wood pyrolysis. *Applied Energy*, 97, 491–497. <https://doi.org/10.1016/j.apenergy.2011.12.056>



- Smith, E. A., Park, S., Klein, A. T., & Lee, Y. J. (2012). Bio-oil analysis using negative electrospray ionization: Comparative study of high-resolution mass spectrometers and phenolic versus sugaric components. *Energy and Fuels*, 26(6), 3796–3802. <https://doi.org/10.1021/ef3003558>
- Solarte-Toro, J. C., González-Aguirre, J. A., Poveda Giraldo, J. A., & Cardona Alzate, C. A. (2021). Thermochemical processing of woody biomass: A review focused on energy-driven applications and catalytic upgrading. *Renewable and Sustainable Energy Reviews*, 136(September 2020). <https://doi.org/10.1016/j.rser.2020.110376>
- Vyazovkin, S., Burnham, A. K., Criado, J. M., Pérez-Maqueda, L. A., Popescu, C., & Sbirrazzuoli, N. (2011). ICTAC Kinetics Committee recommendations for performing kinetic computations on thermal analysis data. *Thermochimica Acta*, 520(1–2), 1–19. <https://doi.org/10.1016/j.tca.2011.03.034>
- Wang, G., Dai, Y., Yang, H., Xiong, Q., Wang, K., Zhou, J., Li, Y., & Wang, S. (2020). A review of recent advances in biomass pyrolysis. *Energy and Fuels*, 34(12), 15557–15578. <https://doi.org/10.1021/acs.energyfuels.0c03107>
- Wang, S. (2017). *Catalytic fast pyrolysis of softwood under N<sub>2</sub> and H<sub>2</sub> atmosphere* (p. 35). Kth Royal Institute Of Technology.
- Wang, S., Shan, R., Gu, J., Zhang, J., Yuan, H., & Chen, Y. (2020). Pyrolysis municipal sludge char supported Fe/Ni catalysts for catalytic reforming of tar model compound. *Fuel*, 279(2), 118494. <https://doi.org/10.1016/j.fuel.2020.118494>
- Wang, Y. J., Kang, K., Yao, Z. L., Sun, G. T., Qiu, L., Zhao, L. X., & Wang, G. (2018). Effects of different heating patterns on the decomposition behavior of white pine wood during slow pyrolysis. *International Journal of Agricultural and Biological Engineering*, 11(5), 218–223. <https://doi.org/10.25165/j.ijabe.20181105.3156>
- Xing, R., Guo, J., Miao, C., Liu, S., & Pan, H. (2014). Fabrication of protein-coated CdS nanocrystals via microwave-assisted hydrothermal method. *Journal of Experimental Nanoscience*, 9(6), 582–587. <https://doi.org/10.1080/17458080.2012.678891>
- Xu, L., Zhang, J., Ding, J., Liu, T., Shi, G., Li, X., Dang, W., Cheng, Y., & Guo, R. (2020). Pore structure and fractal characteristics of different shale lithofacies in the dalong formation in the western area of the lower yangtze platform. *Minerals*, 10(1). <https://doi.org/10.3390/min10010072>
- Yang, H., Yan, R., Chen, H., Lee, D. H., & Zheng, C. (2007). Characteristics of hemicellulose, cellulose and lignin pyrolysis. *Fuel*, 86(12–13), 1781–1788. <https://doi.org/10.1016/j.fuel.2006.12.013>
- Yanik, J., Stahl, R., Troeger, N., & Sinag, A. (2013). Pyrolysis of algal biomass. *Journal of Analytical and Applied Pyrolysis*, 103, 134–141. <https://doi.org/10.1016/j.jaap.2012.08.016>
- Zhang, Y., Chen, P., Liu, S., Fan, L., Zhou, N., Min, M., Cheng, Y., Peng, P., Anderson, E., Wang, Y., Wan, Y., Liu, Y., Li, B., & Ruan, R. (2017). Microwave-Assisted Pyrolysis of Biomass for Bio-Oil Production. *Pyrolysis, July*. <https://doi.org/10.5772/67442>