

- [4] R. H. H. Ibrahim, L. I. Darvell, J. M. Jones, and A. Williams, "Physicochemical characterisation of torrefied biomass," *Journal of Analytical and Applied Pyrolysis*, vol. 103, pp. 21–30, 2013.
- [5] A. Demirbas, "Combustion characteristics of different biomass fuels, Prog," *Energy Combust. Sci.*, vol. 30, pp. 219–230, 2004.
- [6] B. M. Jenkins and L. L. Baxter *et al.*, "Combustion properties of biomass," *Fuel Process Technol*, vol. 54, pp. 17–46, 1998.
- [7] G. Grause, J. Ishibashi, T. Kameda, T. Bhaskar, and T. Yoshioka, "Kinetic studies of the decomposition of flame retardant containing high-impact polystyrene," *Polym. Degrad. Stab.*, vol. 95, pp. 1129–1137, 2010.
- [8] J. A. Onwudili, N. Insura, and P. T. Williams, "Composition of products from the pyrolysis of polyethylene and polystyrene in a closed batch reactor: Effects of temperature and residence time," *J. Anal. Appl. Pyrolysis*, vol. 86, pp. 293–303, 2009.
- [9] W. J. Hall and P. T. Williams, "Fast pyrolysis of halogenated plastics recovered from waste computers," *Energ. Fuel*, vol. 20, pp. 1536–1549, 2006.
- [10] P. McKendry, "Energy production from biomass (part 1): Overview of biomass," *Biores. Technol.*, vol. 83, pp. 37–46, 2002.
- [11] P. McKendry, "Energy production from biomass (part 1): Overview of biomass," *Biores. Technol.*, vol. 83, pp. 37–46, 2002.
- [12] N. Morita, M. Nakayasu, Y. Kawabata, and H. Nakagome, "Influence of molecular sieves is added in the thermal decomposition of rice husk," *International Journal of Environmental Science and Development*, vol. 8, no. 5, 2017.
- [13] J. B. Gujar, M. A. Chaudhari, D. S. Kawade, and M. S. Shingare, "Molecular sieves: An efficient and reusable catalyst for multi-component synthesis of dihydropyrano [2,3-C] pyrazole derivatives," *Tetrahedron Letters*, vol. 55, pp. 6030–6033, 2014.
- [14] A. V. Bridgwater and M. L. Cottam, "Energy fuels," vol. 6, no. 2, pp. 113–120, 1992.
- [15] E. Churin, "Energy: Catalytic treatment of pyrolysis oils, Cat. No. CD-NA-12480-EN-C," *The Commission of the European Communities*, Luxembourg, 1990.
- [16] J. B. Gujar, M. A. Chaudhari, D. S. Kawade, and M. S. Shingare, "Molecular sieves: An efficient and reusable catalyst for multi-component synthesis of dihydropyrano [2,3-C]pyrazole derivatives," *Tetrahedron Letters*, vol. 55, pp. 6030–6033, 2014.
- [17] H. Ren, H. Lei, L. Wang, Q. Bu, and S. Chen, and J. Wu, "Thermal behaviour and kinetic study for woody biomass torrefaction and torrefied biomass pyrolysis by TGA," *Biosystems Engineering*, vol.116, pp. 420–426, 2013.
- [18] C. Couhert and J.-M. Commandre, "Sylvain salvador, is it possible to predict gas yields of any biomass after rapid pyrolysis at high temperature from its composition in cellulose, hemicellulose and lignin?" *Fuel*, vol. 88, pp. 408–41, 2009.
- [19] M. Garcia-Perez, A. Chaala, and H. Pakdel *et al.*, "Characterization of bio-oils in chemical families," *Biomass Bioenergy*, vol. 31, pp. 222–242, 2007.
- [20] R. J. Evans and T. A. Milne, "Molecular characterization of the pyrolysis of biomass.1. fundamentals," *Energy Fuels*, vol. 1, pp. 123–37, 1987.
- [21] A. V. Bridgwater, "Renewable fuels and chemicals by thermal processing of biomass," *Chem. Eng. J.*, vol. 91, pp. 87–102, 2003.
- [22] H. B. Goyal, D. Seal, and R. C. Saxena, "Bio-fuels from thermochemical conversion of renewable resources: A review," *Renew Sustain Energy Rev.*, vol. 12, pp. 504–17, 2008.
- [23] K. Hanazawa, M. Toritsuka, and N. Morita. "Effects of adding hydrotalcite with different compositional ratios in the pyrolysis treatment of brominated plastics," *International Journal of Chemical Engineering and Applications*, vol. 12, no. 1, 2021.
- [24] T. Kameda, M. Nakamura, and T. Yoshioka, "Removal of antimonate ions from an aqueous solution by anion exchange with magnesium-aluminum layered double hydroxide and the formation of a brandholzite-like structure," *Journal of Environmental Science and Health, Part A*, vol. 47, pp.1146–1151, 2012.
- [25] Y. Sun, "Catalytic oxidation performances of typical oxygenated volatile organic compounds (acetone and acetaldehyde) over MAIO (M = Mn, Co, Ni, Fe) hydrotalcite-derived oxides," *Catalysis Today*, vol. 327, pp. 389–397, 2019.
- [26] R. M. Navarro, "Catalytic fast pyrolysis of biomass over Mg-Al mixed oxides derived from hydrotalcite-like precursors: Influence of Mg/Al ratio," *Journal of Analytical and Applied Pyrolysis*, vol. 134, pp. 362–370, 2018.
- [27] R. Hanazawa, K. Nakamura, H. Kawaraya, R. Shimizu, and N. Morita, "Effects of additives on gasification of unused cedar wood by pyrolysis", *International Journal of Chemical Engineering and Applications*, vol. 13, no. 3, 2022.

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