



## REFERENCES

- A.B.M, S.H., Aishah, S., 2008. Biodiesel Fuel Production from Algae as Renewable Energy. *Biochem. Biotechnol.* 4, 250–254.
- Ación, F.G., Fernández, J.M., Molina-Grima, E., 2013. Economics of Microalgae Biomass Production. *Biofuels from Algae* 313–325.
- Ahmad, N., Javed, F., Awan, J.A., Ali, S., Fazal, T., Hafeez, A., Aslam, R., Rashid, N., Rehman, M.S.U., Zimmerman, W.B., Rehman, F., 2019. Biodiesel production intensification through microbubble mediated esterification. 235, 23-51
- Al-Hothaly, K.A., Adetutu, E.M., Taha, M., Fabbri, D., Lorenzetti, C., Conti, R., May, B.H., Shar, S.S., Bayoumi, R.A., Ball, A.S., 2015. Bio-harvesting and pyrolysis of the microalgae *Botryococcus braunii*. *Bioresour. Technol.* 191, 117–123.
- Ali, I., Naqvi, S.R., Bahadar, A., 2018. Kinetic analysis of *Botryococcus braunii* pyrolysis using model-free and model fitting methods. *Fuel* 214, 369–380.
- Anderson, J.W., Baird, P., Davis, R.H., Ferreri, S., Knudtson, M., Koraym, A., Waters, V., Williams, C.L., 2009. Health benefits of dietary fiber. *Nutr. Rev.* 67, 188–205.
- Anto, S., Mukherjee, S.S., Muthappa, R., Mathimani, T., Deviram, G., Kumar, S.S., Verma, T.N., Pugazhendhi, A., 2020. Algae as green energy reserve: Technological outlook on biofuel production. *Chemosphere* 242, 125079.
- Apt, K.E., Behrens, P.W., 1999. Commercial developments in microalgal biotechnology. *J. Phycol.* 35, 215–226.
- Babich, I. V., van der Hulst, M., Lefferts, L., Moulijn, J.A., O'Connor, P., Seshan, K., 2011. Catalytic pyrolysis of microalgae to high-quality liquid bio-fuels. *Biomass and Bioenergy* 35, 3199–3207.
- Bamati, N., Raoofi, A., 2019. Development level and the impact of technological factor on renewable energy production. *Renew. Energy.* 151, 946-955
- Banerjee, A., Sharma, R., Chisti, Y., Banerjee, U.C., 2002. *Botryococcus braunii*: A renewable source of hydrocarbons and other chemicals. *Crit. Rev. Biotechnol.* 22, 245–279.
- Bansemir, A., Blume, M., Schröder, S., Lindequist, U., 2006. Screening of cultivated seaweeds for antibacterial activity against fish pathogenic bacteria. *Aquaculture* 252, 79–84.



Becker, W., 2007. Microalgae in Human and Animal Nutrition. *Handb. Microalgal Cult.* 312–351.

Bellinger, E., Sigee, D., 2010. *Freshwater Algae: Identification and Use as Bioindicators*, Wiley-Blackwell. pp 1-43

Borowitzka, M.A., 1999. Commercial production of microalgae: ponds, tanks, and fermenters. *Prog. Ind. Microbiol.* 35, 313–321.

Bradbury, A.G.W., Sakai, Y., Shafizadeh, F., 1979. A kinetic model for pyrolysis of cellulose. *J. Appl. Polym. Sci.* 23, 3271–3280.

Brennan, L., Owende, P., 2010. Biofuels from microalgae-A review of technologies for production, processing, and extractions of biofuels and co-products. *Renew. Sustain. Energy Rev.* 14, 557–577.

Brown, R.C., 2006. Chapter 11 Biomass Refineries Based on Hybrid Thermochemical-Biological Processing-An Overview, in: Kamm, D.B., Gruber, D.P.R., Kamm Dr., M. (Eds.), *Biorefineries-Industrial Processes and Products: Status Quo and Future Directions*. WILEY-VCH Verlag GmbH & Co. KGaA, pp. 227–252.

Bulkowska, K., Pawłowski, A., 2016. 3 Biomass feedstock for biofuels production, in: CRC Press (Ed.), *Biomass for Biofuels*. Olsztyn, Poland, pp. 37–62.

Bundhoo, Z.M.A., 2018. Microwave-assisted conversion of biomass and waste materials to biofuels. *Renew. Sustain. Energy Rev.* 82, 1149–1177.

Cabanelas, I.T.D., Marques, S.S.I., de Souza, C.O., Druzian, J.I., Nascimento, I.A., 2015. *Botryococcus*, what to do with it? Effect of nutrient concentration on biorefinery potential. *Algal Res.* 11, 43–49.

Camacho, F., Molina, E., Martínez, M.E., Sánchez, S., García, F., 1990. Continuous culture of the marine microalga *Tetraselmis* sp. - productivity analysis. *Aquaculture* 90, 75–84.

Campanella, A., Harold, M.P., 2012. Fast pyrolysis of microalgae in a falling solids reactor: Effects of process variables and zeolite catalysts. *Biomass and Bioenergy* 46, 218–232.

Cherubini, F., 2010. The biorefinery concept: Using biomass instead of oil for producing energy and chemicals. *Energy Convers. Manag.* 51, 1412–1421.



Chowdhury, H., Loganathan, B., 2019. Third-generation biofuels from microalgae: a review. *Curr.*

*Opin. Green Sustain. Chem.* pp 575-588

Churin, E., Delmon, B., 1989. What can we do with pyrolysis oils? *Pyrolysis Gasification*. Elsevier Appl. Sci. London, 326–333.

Correa, D.F., Beyer, H.L., Possingham, H.P., Thomas-Hall, S.R., Schenk, P.M., 2017. Biodiversity impacts of bioenergy production: Microalgae vs. first generation biofuels. *Renew. Sustain. Energy Rev.* 74, 1131–1146.

Couhert, C., Commandré, J.M., Salvador, S., 2009. Failure of the component additivity rule to predict gas yields of biomass in flash pyrolysis at 950 °C. *Biomass and Bioenergy* 33, 316–326.

Dahman, Y., Syed, K., Begum, S., Roy, P., Mohtasebi, B., 2019. Biofuels: Their characteristics and analysis, Biomass, Biopolymer-Based Materials, and Bioenergy: Construction, Biomedical, and other Industrial Applications. Elsevier Ltd. pp 277-325

Day, J.W., Rybczyk, J.M., 2019. Global Change Impacts on the Future of Coastal Systems: Perverse Interactions Among Climate Change, Ecosystem Degradation, Energy Scarcity, and Population, Coasts and Estuaries: The Future. Elsevier Inc. pp 621-639

Dayananda, C., Sarada, R., Kumar, V., Ravishankar, G.A., 2007. Isolation and characterization of hydrocarbon producing green alga *Botryococcus braunii* from Indian freshwater bodies. *Electron. J. Biotechnol.* 10, 79-91

Demirbas, A., 2010. Use of algae as biofuel sources. *Energy Convers. Manag.* 51, 2738–2749.

Desmorieux, H., Decaen, N., 2006. Convective drying of *Spirulina* in thin layer. *J. Food Eng.* 77, 64–70.

Dong, Q., Xiong, Y., 2014. Kinetics study on conventional and microwave pyrolysis of moso bamboo. *Bioresour. Technol.* 171, 127–131.

FAO/WHO/UNU, 2007. PROTEIN AND AMINO ACID REQUIREMENTS IN HUMAN NUTRITION, WHO Technival report series.

Fernandes, B.D., Mota, A., Teixeira, J.A., Vicente, A.A., 2015. Continuous cultivation of photosynthetic microorganisms: Approaches, applications and future trends. *Biotechnol. Adv.* 33, 1228–1245.

Fuad, M.A.H., Mohd, H., Faizal, M., Ani, F.N., 2019. Microwave torrefaction for viable fuel production: A review on theory, affecting factors, potential and challenges. *Fuel* 253, 512–526.



Gaskin, J., C. Steiner, K. Harris, K. C. Das, B. Bibens, 2008. Effect of Low-Temperature Pyrolysis

Conditions on Biochar for Agricultural Use. *Trans. ASABE* 51, 2061–2069.

Geada, P., Vasconcelos, V., Vicente, A., Fernandes, B., 2017. Chapter 13 Microalgal Biomass

Cultivation. *Algal Green Chem. Recent Prog. Biotechnol.* 257–284.

Guaman Burneo, M.C., Gonzalez Romero, N.P., 2016. *Catalogo de microalgas y cianobacterias de agua dulce del Ecuador*, 1st ed, Corporacion para la investigacion Energetica. Quito, Ecuador.

He, M., Xiao, B., Liu, S., Hu, Z., Guo, X., Luo, S., Yang, F., 2010. Syngas production from pyrolysis of municipal solid waste (MSW) with dolomite as downstream catalysts. *J. Anal. Appl. Pyrolysis* 87, 181–187.

Hilbers, T.J., Wang, Z., Pecha, B., Westerhof, R.J.M., Kersten, S.R.A., Pelaez-Samaniego, M.R., Garcia-Perez, M., 2015. Cellulose-Lignin interactions during slow and fast pyrolysis. *J. Anal. Appl. Pyrolysis* 114, 197–207.

Huang, Y.F., Chen, W.R., Chiueh, P.T., Kuan, W.H., Lo, S.L., 2012. Microwave torrefaction of rice straw and pennisetum. *Bioresour. Technol.* 123, 1–7.

Huang, Y.F., Chiueh, P. Te, Kuan, W.H., Lo, S.L., 2013. Microwave pyrolysis of rice straw: Products, mechanism, and kinetics. *Bioresour. Technol.* 142, 620–624.

Husk, B., Major, J., 2010. Commercial scale agricultural biochar field trial in Québec, Canada over two years: effects of biochar on soil fertility, biology and crop productivity and quality. *Dynamotive Energy Syst.* Febr.

International Energy Agency, 2017. *CO<sub>2</sub> Emissions from fuel combustion 2017 - Highlights*. Int. Energy Agency.

Islam, M.R., 2015. *UNCONVENTIONAL GAS RESERVOIRS Evaluation, Appraisal, and Development*. Elsevier, London, Ontario, Canada.

Jahirul, M.I., Rasul, M.G., Chowdhury, A.A., Ashwath, N., 2012. Biofuels production through biomass pyrolysis- A technological review. *Energies* 5, 4952–5001.

Kantarelis, E., Donaj, P., Yang, W., Zabaniotou, A., 2009. Sustainable valorization of plastic wastes for energy with environmental safety via High-Temperature Pyrolysis (HTP) and High-Temperature Steam Gasification (HTSG). *J. Hazard. Mater.* 167, 675–684.

Kawamoto, H., Yamamoto, D., Saka, S., 2008. Influence of neutral inorganic chlorides on primary and secondary char formation from cellulose. *J. Wood Sci.* 54, 242–246.



- Lahaye, M., 1991. Marine algae as sources of fibres: Determination of soluble and insoluble dietary fibre contents in some 'sea vegetables.' *J. Sci. Food Agric.* 54, 587–594.
- Lee, J., Kwon, E.E., Park, Y.K., 2019. Recent advances in the catalytic pyrolysis of microalgae. *Catal. Today* 0–1.
- Lin, B., Li, H., Chen, Z., Zheng, C., Hong, Y., Wang, Z., 2017. Sensitivity analysis on the microwave heating of coal: A coupled electromagnetic and heat transfer model. *Appl. Therm. Eng.* 126, 949–962.
- Liu, Y.Q., Lim, L.R.X., Wang, J., Yan, R., Mahakant, A., 2012. Investigation on pyrolysis of microalgae *botryococcus braunii* and *Hapalosiphon* sp. *Ind. Eng. Chem. Res.* 51, 10320–10326.
- Lum, K.K., Kim, J., Lei, X.G., 2013. Dual potential of microalgae as a sustainable biofuel feedstock and animal feed. *J. Anim. Sci. Biotechnol.* 4, 1–7.
- Marchetti, J., Bougaran, G., Le Dean, L., Mégrier, C., Lukomska, E., Kaas, R., Olivo, E., Baron, R., Robert, R., Cadoret, J.P., 2012. Optimizing conditions for the continuous culture of *Isochrysis affinis galbana* relevant to commercial hatcheries. *Aquaculture* 326–329, 106–115.
- Marcilla, A., Catalá, L., García-Quesada, J.C., Valdés, F.J., Hernández, M.R., 2013. A review of thermochemical conversion of microalgae. *Renew. Sustain. Energy Rev.* 27, 11–19.
- Matos, Â.P., Feller, R., Moecke, E.H.S., de Oliveira, J.V., Junior, A.F., Derner, R.B., Sant'Anna, E.S., 2016. Chemical Characterization of Six Microalgae with Potential Utility for Food Application. *JAOCs, J. Am. Oil Chem. Soc.* 93, 963–972.
- Miao, X., Wu, Q., Yang, C., 2004. Fast pyrolysis of microalgae to produce renewable fuels. *J. Anal. Appl. Pyrolysis* 71, 855–863.
- Monsef-Mirzai, P., Ravindran, M., McWhinnie, W.R., Burchill, P., 1995. Rapid microwave pyrolysis of coal. *J. Chem. Eng. Japan* 33, 20–27.
- Morais, A.R., Bogel-Lukasik, R., 2013. Green chemistry and the biorefinery. *RSC Green Chem.* 1–24.
- Muller-Feuga, A., 2000. The role of microalgae in aquaculture: Situation and trends. *J. Appl. Phycol.* 12, 527–534.
- Mushtaq, F., Mat, R., Ani, F.N., 2014. A review on microwave assisted pyrolysis of coal and biomass for fuel production. *Renew. Sustain. Energy Rev.* 39, 555–574.
- Naik, S.N., Goud, V. V., Rout, P.K., Dalai, A.K., 2010. Production of first and second generation



- biofuels: A comprehensive review. *Renew. Sustain. Energy Rev.* 14, 578–597.
- Niccolai, A., Chini Zittelli, G., Rodolfi, L., Biondi, N., Tredici, M.R., 2019. Microalgae of interest as food source: Biochemical composition and digestibility. *Algal Res.* 42, 1-9.
- Noe, J.D.E.L.A., Pauw, N.D.E., 1988. the Potential of Microalgal Biotechnology : a Review of Production and Uses of Mocoalga. *Biotechnol. Adv.* 6, 725–770.
- Pulz, O., Gross, W., 2004. Valuable products from biotechnology of microalgae. *Appl. Microbiol. Biotechnol.* 65, 635–648.
- Rahman, S.N.F.S.A., Rahman, N.A., Idris, S.S., Bakar, N.F.A., Mokhtar, R., 2015. Microwave pyrolysis assisted with carbon based absorbent: An overview. *J. Teknol.* 76, 17–20.
- Reboloso-Fuentes, M.M., Navarro-Pérez, A., García-Camacho, F., Ramos-Miras, J.J., Guil-Guerrero, J.L., 2001. Biomass nutrient profiles of the microalga *Nannochloropsis*. *J. Agric. Food Chem.* 49, 2966-2972.
- Ribeiro, L.A., da Silva, P.P., Mata, T.M., Martins, A.A., 2015. Prospects of using microalgae for biofuels production: Results of a Delphi study. *Renew. Energy* 75, 799–804.
- Ritchie, H., Roser, M., 2014. *Energy [WWW Document]. Our world Data.*
- Satpathy, S.K., Tabil, L.G., Meda, V., Naik, S.N., Prasad, R., 2014. Torrefaction of wheat and barley straw after microwave heating. *Fuel* 124, 269–278.
- Shafiee, S., Topal, E., 2009. When will fossil fuel reserves be diminished? *Energy Policy* 37, 181–189.
- Siritherasas, P., Waiyanate, P., Sekiguchi, H., Kodama, S., 2017. Torrefaction of Municipal Solid Waste (MSW) Pellets using Microwave Irradiation with the Assistance of the Char of Agricultural Residues. *Energy Procedia* 138, 668–673.
- Soletto, D., Binaghi, L., Lodi, A., Carvalho, J.C.M., Converti, A., 2005. Batch and fed-batch cultivations of *Spirulina platensis* using ammonium sulphate and urea as nitrogen sources. *Aquaculture* 243, 217–224.
- Spolaore, P., Joannis-Cassan, C., Duran, E., Isambert, A., 2006. Commercial applications of microalgae. *J. Biosci. Bioeng.* 101, 87–96.
- Stolz, P., Obermayer, B., 2005. Manufacturing microalgae for skin care. *Cosmet. Toilet.* 120, 99–106.
- Suali, E., Sarbatly, R., 2012. Conversion of microalgae to biofuel. *Renew. Sustain. Energy Rev.* 16, 4316–4342.



- Tibbetts, S.M., Milley, J.E., Lall, S.P., 2015. Chemical composition and nutritional properties of freshwater and marine microalgal biomass cultured in photobioreactors. *J. Appl. Phycol.* 27, 1109–1119.
- Tomaselli, L., Richmond, A., 2004. Handbook of Microalgal Culture: Applied Phycology and Biotechnology, in: *Handbook of Microalgal Culture: Applied Phycology and Biotechnology*. pp. 1–20.
- van Zwieten, L., Kimber, S., Morris, S., Chan, K.Y., Downie, A., Rust, J., Joseph, S., Cowie, A., 2010. Effects of biochar from slow pyrolysis of papermill waste on agronomic performance and soil fertility. *Plant Soil* 327, 235–246.
- Vo Hoang Nhat, P., Ngo, H.H., Guo, W.S., Chang, S.W., Nguyen, D.D., Nguyen, P.D., Bui, X.T., Zhang, X.B., Guo, J.B., 2018. Can algae-based technologies be an affordable green process for biofuel production and wastewater remediation? *Bioresour. Technol.* 256, 491–501.
- Wan, M., Zhang, Z., Wang, R., Bai, W., Huang, J., Wang, W., Shen, G., Yu, A., Li, Y., 2019. High-yield cultivation of *Botryococcus braunii* for biomass and hydrocarbons. *Biomass and Bioenergy* 131, 105399.
- Wang, M.J., Huang, Y.F., Chiueh, P.T., Kuan, W.H., Lo, S.L., 2012. Microwave-induced torrefaction of rice husk and sugarcane residues. *Energy* 37, 177–184.
- Wei, L., Xu, S., Zhang, L., Zhang, H., Liu, C., Zhu, H., Liu, S., 2006. Characteristics of fast pyrolysis of biomass in a free fall reactor. *Fuel Process. Technol.* 87, 863–871.
- Wu, C., Budarin, V.L., Gronnow, M.J., De Bruyn, M., Onwudili, J.A., Clark, J.H., Williams, P.T., 2014. Conventional and microwave-assisted pyrolysis of biomass under different heating rates. *J. Anal. Appl. Pyrolysis* 107, 276–283.
- Wu, T., Han, X., Zheng, M.M., Ou, X., Sun, H., Zhang, X., 2019. Impact factors of the real-world fuel consumption rate of light duty vehicles in China. *Energy* 116388.
- Yang, C., Li, R., Zhang, B., Qiu, Q., Wang, B., Yang, H., Ding, Y., Wang, C., 2019. Pyrolysis of microalgae: A critical review. *Fuel Process. Technol.* 186, 53–72.
- Yanik, J., Stahl, R., Troeger, N., Sinag, A., 2013. Pyrolysis of algal biomass. *J. Anal. Appl. Pyrolysis* 103, 134–141.
- Yin, C., 2012. Microwave-assisted pyrolysis of biomass for liquid biofuels production. *Bioresour. Technol.* 120, 273–284.



Zaman, C.Z., Pal, K., Yehye, W.A., Sagadevan, S., Shah, S.T., Adebisi, G.A., Marlina, E., Rafique, R.F.,

Johan, R. Bin, 2017. chapter 1 Pyrolysis: A Sustainable Way to Generate Energy from Waste.

Pyrolysis. pp 1-36.

Zhao, X., Wang, M., Liu, H., Li, L., Ma, C., Song, Z., 2012. A microwave reactor for characterization of

Zheng, X., Streimikiene, D., Balezentis, T., Mardani, A., Cavallaro, F., Liao, H., 2019. A review of  
greenhouse gas emission profiles, dynamics, and climate change mitigation efforts across the  
key climate change players. *J. Clean. Prod.* 234, 1113–1133.

Zlotorzynski, A., 1995. The Application of Microwave Radiation to Analytical and Environmental  
Chemistry. *Crit. Rev. Anal. Chem.* 25, 43–76.