DAFTAR PUSTAKA

Achinas, S., and Euverink, G. J. W., 2016, "Theoretical analysis of biogas potential prediction from agricultural waste", *Resource-Efficient Technologies*, 2(3), 143–147. https://doi: 10.1016/j.reffit.2016.08.001.

Agabo-García, C., Pérez, M., and Solera, R., 2020, "Adaptation of thermophilic sludge-inoculum to co-digestion with Sherry-wine distillery wastewater" *Biomass and Bioenergy*, 139, 105628. http://doi:10.1016/j.biombioe.2020.10562

Alam, M. Z., Ameem, E. S., Muyibi, S. A., and Kabbashi, N. A., 2009, "The factors affecting the performance of activated carbon prepared from oil palm empty fruit bunches for adsorption of phenol", *Chemical Engineering Journal*, 155(1-2), 191–198. http://doi:10.1016/j.cej.2009.07.033

Amaya, O. M., Barragán, M. T. C., and Tapia, F. J. A., 2013. Microbial Biomass in Batch and Continuous System, *Biomass Now - Sustainable Growth and Use*, Miodrag Darko Matovic, London: IntechOpen, 451-478. https://doi:10.5772/553 03.

Amekan, Y., 2020, "The influence of microbial community dynamics on anaerobic digestion efficiency and stability": A Review. *International Journal of Renewable Energy Development*, 9(1), 85. http://doi:10.14710/ijred.9.1.85-95.

Anukam, A., Mohammadi, A., Naqvi, M., and Granström, K., 2019. "A review of the chemistry of anaerobic digestion: Methods of accelerating and optimizing process efficiency", *Processes*, 7(8), 1–19. https://doi:10.3390/PR7080504.

Ao, T., Li, R., Chen, Y., Li, C., Li, Z., Liu, X., Ran, Y., and Li, D., 2019, "Anaerobic thermophilic digestion of maotai-flavored distiller's grains: process performance and microbial community dynamics", *Energy and Fuels*, 33(9), 8804–8811. https://doi.org/10.1021/acs.energyfuels.9b02582.

Ao, T., Xie, Z., Zhou, P., Liu, X., Wan, L., and Li, D., 2020, "Comparison of functional microbial profile between mesophilic and thermophilic anaerobic digestion of vegetable waste". *Research Square*, 1-25. https://doi:10.21203/rs.3.rs-54152/v1.

Badan Pusat Statistik, 2020, Statistik Kelapa Sawit Indonesia 2019. Jakarta Pusat : Badan Pusat Statistik. https://www.bps.go.id/publication/2020/11/30/36cba77a73179202def4ba14/statistik-kelapa-sawit-indonesia-2019.html

Bala, J. D., Lalung, J. and Ismail, N. (2014) 'Palm Oil Mill Effluent (POME) Treatment "'Microbial Communities in an Anaerobic Digester": A Review',

International Journal of Scientific and Research Publications, 4(6), pp. 1–24. https//www.ijsrp.org.

Blank, C. E. (2009). 'Phylogenomic Dating - The Relative Antiquity of Archaeal Metabolic and Physiological Traits.' *Astrobiology* 9 (2): pp. 193–219. https://doi.org/10.1089/ast.2008.0248.

Barros, A. E. L., Almeida, A. M. P., Carvalho, L. B. Jr., and Azevedo, W. M., 2002, "Polysiloxane/PVA-glutaraldehydehybrid composite as solid phase or immunodetections by ELISA". *Braz. J. Med. Biol. Res*., 35, 459–463. http://doi:10.1590/s0100-879x2002000400008.

Bhardwaj, S., 2017, "A Review : Advantages and Disadvantages of Biogas", *International Research Journal of Engineering and Technology*, 04(10), 890-893. https://www.irjet.net/archives/V4/i10/IRJET-V4I10155.pdf.

Boles, J. R., 1972, "Composition, Optical Properties, Cell Dimensions and Thermal Stability of Some Heulandite Group Zeolites", *American Mineral*, 57, 1463–1493. http://www.minsocam.org/ammin/AM57/AM57_1463.pdf.

Cadar, O., Senila, M., Hoaghia, M.-A., Scurtu, D., Miu, I., and Levei, E. A., 2020 "Effects of thermal treatment on natural clinoptilolite-rich zeolite behavior in simulated biological fluids", *Molecules*, 25(11), pp. 1–12. http://doi:10.3390/molecules25112570.

Cahyono, R. B. Ismiyati, S., Simparmin, Br G., Mellyanawati, M., and Budhijanto. W., 2018, "Characterization of modified zeolite as microbial immobilization media on POME anaerobic digestion", *IOP Conference Series: Materials Science and Engineering*, 316(1), 1-10. http://doi:10.1088/1757-899X/316/1/012070.

Chen, S., He, J., Wang, H., Dong, B., Li, N., and Dai, X., 2018, "Microbial responses and metabolic pathways reveal the recovery mechanism of an anaerobic digestion system subjected to progressive inhibition by ammonia", *Chemical Engineering Journal*, 350, 312–323. http://doi:10.1016/j.cej.2018.05.168

Ciezkowska, M., Bajda, T., Decewicz, P., Dziewit, L., and Drewniak, L., 2020, "Effect of clinoptilolite and halloysite addition on biogas production and microbial community structure during anaerobic digestion", *Materials*, 13(18), 1-17. http://doi: 10.3390/ma13184127.

Clark, D. P., 1989, "The fermentation pathways of Escherichia coli". F*EMS Microbiology Letters*, 63(3), 223–234. https://doi.org/10.1016/0378-1097(89)90132-8

Cohen, Y., 2001, "Biofiltration - The treatment of fluids by microorganisms immobilized into the filter bedding material: a review", *Bioresource Technology*, 77(3), 257–274. http://doi: 10.1016/S0960-8524(00)00074-2.

Demirel, B., and Yenigün, O, 2002, "The Effects of Change in Volatile Fatty Acid (VFA) Composition on Methanogenic Upflow Filter Reactor (UFAF) Performance", *Environmental Technology*, 23(10), 1179–1187. https://doi.org/10.1080/09593332308618336

Duncan, S. H., Louis, P., and Flint, H. J., 2004, "Lactate-utilizing bacteria, isolated from human feces, that produce butyrate as a major fermentation product", *Applied and environmental microbiology*, 70(10), 5810–5817. http://doi:10.1128/AEM.70.10.5810-5817.2004.

Eş, I., Vieira, J. D. G. and Amaral, A. C., 2015, "Principles, techniques, and applications of biocatalyst immobilization for industrial application", *Applied Microbiology and Biotechnology*, 99(5), pp. 2065–2082. http://doi:10.1007/s00253-015-6390-y.

Eusébio, A., Neves, A., and Marques IP., 2021, "Structure of Microbial Communities When Complementary Effluents Are Anaerobically Digested', *Applied Sciences*, 11(3), 1-17. https://doi.org/10.3390/app11031293.

Fagbohungbe, M. O., Herbert, B. M.J., Hurst, L., Ibeto., C.N., Li, H., Usmani, S.Q., and Semple, K. T., 2017, "The challenges of anaerobic digestion and the role of biochar in optimizing anaerobic digestion", *Waste Management*, 61, 236–249. http://doi: 10.2174/1874070701711010016.

Faschian, R. Eren, I., Minden, S., and Portner R., 2017, "Evaluation of Fixed-Bed Cultures with Immobilized Lactococcus Lactis ssp. Lactis on Different Scales", *The Open Biotechnology Journal*, 11(1), 16–25. http://doi:10.2174/1874070701711010016.

Faschian, R., De, S. and Pörtner, R., 2016, "Multi-Fixed-Bed Bioreactor System Applied for Bioprocess Development of Immobilized Lactic Acid Bacteria", *The Open Biotechnology Journal*, 10(1),1–9. http://doi:10.2174/1874070701610010001.

Finotello, F., Mastrorilli, E., and Di Camillo, B., 2016, "Measuring the diversity of the human microbiota with targeted next-generation sequencing", *Briefings in Bioinformatics*, 119, 1-14. http://doi:10.1093/bib/bbw119.

Gaby, J.C., Zamanzadeh, M., and Horn, S.J., 2017, "The effect of temperature and retention time on methane production and microbial community composition in staged anaerobic digesters fed with food waste", *Biotechnol Biofuels* 10(1), 1-13. https://doi.org/10.1186/s13068-017-0989-4

Gandy, J. J., Laurens, I. and Snyman, J. R., 2015, "Potentiated clinoptilolite reduces signs and symptoms associated with veisalgia", *Clinical and Experimental Gastroenterology*, 8, 271–277. http://doi:10.2147/CEG.S81929.

Garritano, A. N. Faber., M., O., De Sa, L R.V., and Leitao, V. S. F., 2018, "Palm oil mill effluent (POME) as raw material for biohydrogen and methane

production via dark fermentation", *Renewable and Sustainable Energy Reviews*, 92, 676–684. http://doi:10.1016/j.rser.2018.04.031.

Genisheva, Z., Teixeira, J. A. and Oliveira, J. M., 2014, "Immobilized cell systems for batch and continuous winemaking", *Trends in Food Science and Technology*, 40(1), 33–47. http://doi:10.1016/j.tifs.2014.07.009.

Gerardi, M.H., 2006, *Wastewater Bacteria*, New Jersey: Wiley-Interscience. 19–31.

Gerrard, L.A., Henry, P.F., Weller, M.T., and Ahmed, A., 2004, "Structure and ion exchange properties of the natural zeolites edingtonite and goosecreekite". *Studies in Surface Science and Catalysis* 154, 1341–1348. https://doi.org/10.1016/S0167-2991(04)80647-5

Halim, L. Mellyanawati, M., Cahyono, R.B., Sudibyo, H., and Budhijanto, W., 2017, "Anaerobic digestion of palm oil mill effluent with lampung natural zeolite as microbe immobilization medium and digested cow manure as starter", *AIP Conference Proceedings*, 1840, 1-9. http://doi:10.1063/1.4982333.

Han, Z. Chen, F., Zhong, C., Zhou, J., Wu, X., Yong, X., Zhou, H. Jiang, M., Jia, H., and Wei, P., 2017, "Effects of different carriers on biogas production and microbial community structure during anaerobic digestion of cassava ethanol wastewater", *Environmental Technology (United Kingdom)*, 38(18), 2253–2262. http://doi:10.1080/09593330.2016.1255666.

Hao, L., Michaelsen, T.Y., Singleton, C.M., Dottorini, G., Kirkegaard, R.H., Albertsen, M., Nielsen, P.H., and Dueholm, M.S., 2020, "Novel syntrophic bacteria in full-scale anaerobic digesters revealed by genome-centric metatranscriptomics", *ISME Journal*, 14(4), 906–918. https://doi.org/10.1038/s41396-019-0571-0

Hattori, S., 2008, "Syntrophic Acetate-Oxidizing Microbes in Methanogenic Environments" *Microbes and Environments*, 23(2), 118–127. http://doi:10.1264/jsme2.23.118.

Hii, K. L., Yeap, S. P. and Mashitah, M. D., 2012, "Cellulase production from palm oil mill effluent in Malaysia: Economical and technical perspectives", *Engineering in Life Sciences*, 12(1), 7–28. http://doi:10.1002/elsc.201000228.

Huang, H., Biswal, B. K., Chen, G.-H., and Wu, D., 2020, "Sulfidogenic anaerobic digestion of sulfate-laden waste activated sludge: Evaluation on reactor performance and dynamics of microbial community", *Bioresource Technology*, 297, 1-9. http//doi:10.1016/j.biortech.2019.12239

Indriyati, I., 2018, "Pengolahan Limbah Cair Organik Secara Biologi Menggunakan Reaktor Anaerobik Lekat Diam", *Jurnal Air Indonesia*, 1(3), 340–343.

http://doi:10.29122/jai.v1i3.2361.

International Seminar on Fundamental and Application of Chemical Engineering, 2016, Ayu, E. D., Halim, L., Mellyanawati, M., and Budhijanto, W., The Effect of Natural Zeolite as Microbial Immobilization Media in Anaerobic Digestion at Various Concentrations of Palm Oil Mill Effluent (POME), Maryland: American Institute of Physics (AIP). http://doi:10.1063/1.4982335.

Jamali, N. S. Rashidi, N. F. D. R., Jahim, J. Md., O-Thong, S., Jehlee, A., and Engliman, N. S., 2019, "Thermophilic biohydrogen production from palm oil mill effluent: Effect of immobilized cells on granular activated carbon in fluidized bed reactor", *Food and Bioproducts Processing*, 117, 231–240. http://doi:10.1016/j.fbp.2019.07.012.

Jameson, E., Rowe, O. F., Hallberg, K. B., and Johnson, D. B., 2010, "Sulfidogenesis and selective precipitation of metals at low pH mediated by Acidithiobacillus spp. and acidophilic sulfate-reducing bacteria", *Hydrometallurgy*, 104(3-4), 488–493. http://doi:10.1016/j.hydromet.2010.03.02

Jang, H. M., Cho, H. U., Park, S. K., Ha, J. H., and Park, J. M., 2014, "Influence of thermophilic aerobic digestion as a sludge pre-treatment and solids retention time of mesophilic anaerobic digestion on the methane production, sludge digestion and microbial communities in a sequential digestion process", *Water Research*, 48, 1–14. http://doi:10.1016/j.watres.2013.06.041

Jiwan, S., Kalamdhad, A. S., and Lee, V. K., 2016, "Effects of Natural Zeolites on Bioavailability and Leachability of Heavy Metals in the Composting Process of Biodegradable Wastes, *Zeolites - Useful Minerals*, Claudia Belviso, London: IntechOpen, 185-201. http://doi:10.5772/63679.

Joyce, A., Ijaz, U. Z., Nzeteu, C., Vaughan, A., Shirran, S. L., Botting, C. H., and Abram, F., 2018, "Linking Microbial Community Structure and Function During the Acidified Anaerobic Digestion of Grass". *Frontiers in Microbiology*, 9, 1-9. http:// doi:10.3389/fmicb.2018.00540

Junter, G. A. and Jouenne, T., 2004, "Immobilized viable microbial cells: From the process to the proteome or the cart before the horse", *Biotechnology Advances*, 22(8), 633–658. http://doi:10.1016/j.biotechadv.2004.06.003.

Júnior, A. D. N. F., Wenzel, J., Etchebehere, C., and Zaiat., M., 2014, "Effect of organic loading rate on hydrogen production from sugarcane vinasse in thermophilic acidogenic fixed bed reactors", *International Journal of Hydrogen Energy*, 39(30), 16852–16862. http://doi:10.1016/j.ijhydene.2014.08.017.

Kampmann, K., Ratering, S., Kramer, I.,Schmidt, M., Zerr, W., and Schnell, S. 2012, “Unexpected Stability of Bacteroidetes and Firmicutes Communities in

Laboratory Biogas Reactors Fed with Different Defined Substrates." *Applied and Environmental Microbiology* 78 (7): 2106–19. https://doi.org/10.1128/AEM.06394-11.

Karmen, M., and Anamarija, F., 2020, "Introductory Chapter: Zeolites - From Discovery to New Applications on the Global Market, *Zeolites - New Challenges*, Karmen Margeta and Anamarija Farkaš, London: IntechOpen, 1-10. http://doi:10.5772/intechopen.92907.

Krebs, 1978, *Ecology. The Experimental Analysis of Distribution and Abundance.* Third Edition, New York: Harper and Row Distribution.

Khadaroo, S. N. B. A., Grassia, P., Gouwanda, D., and Poh, P. E., 2020, "The impact of thermal pretreatment on various solid-liquid ratios of palm oil mill effluent (POME) for enhanced thermophilic anaerobic digestion performance", *Journal of Cleaner Production*, 261, 1-10. https://doi.org/10.1016/j.jclepro.2020.121159.

Khalid, N. A., Rajandas, H., Parimannan, S., Croft, L. J., Loke, S.,Chong, C.S., Bruce, N. C., and Yahya, A., 2019, "Insights into Microbial Community Structure and Diversity in Oil Palm Waste Compost", *3 Biotech* 9 (10): 1–11. https://doi.org/10.1007/s13205-019-1892-4.

Khan, M. A., Patel, P. G., Ganesh, A. G., Rais, N., Faheem, S. M., and Khan, S. T., 2018, "Assessing Methanogenic Archaeal Community in Full Scale Anaerobic Sludge Digester Systems in Dubai, United Arab Emirates", *The Open Microbiology Journal*, 12(1), 123–134. http://doi.org/10.2174/1874285801812010123

Khanal, S. K., 2009, Microbial Fuel Cell: Novel Anaerobic Biotechnology for Energy Generation from Wastewater, *Anaerobic Biotechnology for Bioenergy Production: Principles and Applications*, Liu, H., State Avenue: John Wiley & Sons, Inc., 221-246.

Khayal, O. M. E. S., 2019, *Advantages and limitations of biogas technologies*. Sudan: Nile Valley University. 1-7. http://doi:10.13140/RG.2.2.11989.58087.

Khayum, N., Anbarasu, S. and Murugan, S., 2018, "Biogas potential from spent tea waste: A laboratory scale investigation of co-digestion with cow manure", *Energy*, 165, pp. 760–768. http://doi: 10.1016/j.energy.2018.09.163.

Khemkhao, M., Nuntakumjorn, B., Techkarnjanaruk, S., and Phalakornkule, C., 2011, "Microbial Diversity in Thermophilic Adaptation on Pome Treatment", *KMITL Sci. Tech. J.*, 11(1), pp. 1–8. https://li01.tci-thaijo.org/index.php/cast/article/view/136065/101567.

Kor-Bicakci, G., Ubay-Cokgor, E., and Eskicioglu, C., 2020 "Comparative Analysis of Bacterial and Archaeal Community Structure in Microwave

Pretreated Thermophilic and Mesophilic Anaerobic Digesters Utilizing Mixed Sludge under Organic Overloading", *Water*, 12(3), 887. http://doi:10.3390/w12030887.

Kotsopoulos, T. A. Karamanlis, X., Dotas, D., Martzopoulos., 2008, "The impact of different natural zeolite concentrations on the methane production in thermophilic anaerobic digestion of pig waste", *Biosystems Engineering*, 99(1), 105–111. http://doi: 10.1016/j.biosystemseng.2007.09.018.

Krishnan, S., Singh, L., Sakinah, M., Thakur, S., Wahid, Z. A., and Sohaili, J., 2016, "Effect of organic loading rate on hydrogen (H_2) and methane (CH_4) production in two-stage fermentation under thermophilic conditions using palm oil mill effluent (POME)", *Energy for Sustainable Development*, 34, 130–138. http://doi: 10.1016/j.esd.2016.07.002.

Kushkevych, I. Kobzova, E. Vitezova, M., Vitez, T., Dordevic, D., and Bartos, M., 2019, "Acetogenic microorganisms in operating biogas plants depending on substrate combinations", *Biologia*, 74(9), 1229–1236. http://doi: 10.2478/s11756-019-00283-2.

Lackner, N., Wagner, A.O., and Illmer, P., 2020, "Effect of sulfate addition on carbon flow and microbial community composition during thermophilic digestion of cellulose". *Appl Microbiol Biotechnol* 104, 4605–4615. http://doi:10.1007/s00253-020-10546-7

Lam, M. K. and Lee, K. T., 2011, "Renewable and sustainable bioenergies production from palm oil mill effluent (POME): Win-win strategies toward better environmental protection", *Biotechnology Advances*, 29(1), 124–141. http://doi: 10.1016/j.biotechadv.2010.10.001.

Lalov, I., G., Krysteva, M., A., and Phelouzat, J., L., 2001, "Improvement of biogas production from vinasse via covalently immobilized methanogens". *Bioresource Technology*, 79(1), 83–85. http://doi:10.1016/s0960-8524(01)00045-1.

Li, J., Wang, HZ., Yi, Y., Gou, M., Nobu, M., K., Chen, YT.,Tang, YQ., 2020, "Response of Isovalerate-Degrading Methanogenic Microbial Community to Inhibitors", *Appl Biochem Biotechnol* 191 (1), 1010–1026. https://doi.org/10.1007/s12010-020-03234-9.

Lim, A. Chew, J. J., Ngu, L. H., Ismadji, S., Khaerudini, D. S., and Sunarso, J., 2020, "Synthesis, Characterization, Adsorption Isotherm, and Kinetic Study of Oil Palm Trunk-Derived Activated Carbon for Tannin Removal from Aqueous Solution", *ACS Omega*, 5(44), 28673–28683. http://doi: 10.1021/acsomega.0c03811.

Lutpi, N. A. Jahim, J., Mumtaz, T., Harun, S., and Abdul, P. M., 2016, "Batch and continuous thermophilic hydrogen fermentation of sucrose using anaerobic sludge from palm oil mill effluent via immobilisation technique", *Process*

Biochemistry, 51(2), 297–307. http://doi: 10.1016/j.procbio.2015.11.031.

Maaroff, R. M. Jahim, J., Azahar, A. M., Abdul., P. M., Masdar, M. S., Nordin, D., and Nasir, M. A. A., 2019, "Biohydrogen production from palm oil mill effluent (POME) by two stage anaerobic sequencing batch reactor (ASBR) system for better utilization of carbon sources in POME", *International Journal of Hydrogen Energy*, 44(6), 3395–3406. http://doi: 10.1016/j.ijhydene.2018.06.013.

Madaki, Y.S., and Seng, L., 2013, "Palm oil mill effluent (POME) from Malaysia palm oil mills:waste or resource, *Int. J. Sci. Environ. Technol*. 2 (6), 1138–1155. https://www.ijset.net/journal/191.pdf.

Manaia, C. M., Vaz-Moreira, I., and Nunes, O. C., 2019, "Tepidiphilus. Bergey's Manual of Systematics of Archaea and Bacteria", 1–6. doi:10.1002/9781118960608.gbm0183

Mao, C. Feng, Y., Wang, X.,and Ren, G., 2015, "Review on research achievements of biogas from anaerobic digestion", *Renewable and Sustainable Energy Reviews*, 45, 540–555. http://doi: 10.1016/j.rser.2015.02.032.

Martins, C. S. S., Martins, C. M., Fiúza, L. M. C. G., and Santaella, S. T., 2013, "Immobilization of microbial cells: A promising tool for treatment of toxic pollutants in industrial wastewater", *African Journal of Biotechnology*, 12(28), 4412–4418. http://doi: 10.5897/ajb12.2677.

Meesap, K., Boonapatcharoen, N., Techkarnjanaruk, S., and Chaiprasert, P., 2012, "Microbial communities and their performances in anaerobic hybrid sludge bed-fixed film reactor for treatment of palm oil mill effluent under various organic pollutant concentrations", *Journal of Biomedicine and Biotechnology*, 2012. 1-11. http://doi: 10.1155/2012/902707.

Menzel, T, Neubauer, P., and Junne, S., 2020, "Role of Microbial Hydrolysis in Anaerobic Digestion". *Energies*.; 13(21), 1-29. http://doi:10.3390/en13215555.

Moghaddam, S. A. E., Harun, R., Mokhtar, M. N., and Zakaria, R., 2018, "Potential of Zeolite and Algae in Biomass Immobilization", *BioMed Research International*, 2018, 1-16. https://doi.org/10.1155/2018/6563196.

Mohd-Nor, D., Ramli, N., Sharuddin, A. S., Hassan, M. A., Mustapha, N. A., Ariffin, H., Sakai, K., Tashiro, Y., Shirai, Y., and Maeda, T., 2019, "Dynamics of microbial populations responsible for biodegradation during the full-scale treatment of palm oil mill effluent", *Microbes and Environments*, 34(2), 121–128. http://doi: 10.1264/jsme2.ME18104.

Montalvo, S. Guerrero, L., Borja, R., Sanchez, E., Milan, Z., Cortes, I., and Rubia, M. A., 2012, "Application of natural zeolites in anaerobic digestion processes: A review", *Applied Clay Science*, 58, 125–133.

http://doi:10.1016/j.clay.2012.01.013.

Morshed, M. N., Behary, N., Bouazizi, N., Guan, J., and Nierstrasz, V. A., 2021, "An overview on biocatalysts immobilization on textiles: Preparation, progress and application in wastewater treatment. Chemosphere", 279(1), 1-23, https://doi:10.1016/j.chemosphere.2021.13.

Mota, V. T., Santos, F. S., Araújo, T. A., and Amaral, M. C.S., 2015, "Evaluation of Titration Methods for Volatile Fatty Acids Measurement: Effect of the Bicarbonate Interference and Feasibility for the Monitoring of Anaerobic Reactors", *Water Practice and Technology* 10 (3), 486–95. https://doi.org/10.2166/wpt.2015.056.

Mumton, F.A., 1960, "Clinoptilolite Redefined", *American Mineral*. 45(3-4), 351–359.

Muratçobanoğlua, H., Gökçeka, O. B., Merta, R., A., Zan, R., and Demirela, S., 2020, "Simultaneous synergistic effects of graphite addition and co-digestion of food waste and cow manure: Biogas production and microbial community", *Bioresource Technology*. 309, 123365. https://doi:10.1016/j.biortech.2020.123365.

Mutschlechner, M., Praeg, N. and Illmer, P., 2020, "Soil-Derived Inocula Enhance Methane Production and Counteract Common Process Failures During Anaerobic Digestion", *Frontiers in Microbiology*, 11, 1–18. https://doi: 10.3389/fmicb.2020.572759.

Nitipan, S. Mamimin, C., Intrasungkha, N., Birkeland, N, K., and O-Thong, S., 2014, "Microbial community analysis of thermophilic mixed culture sludge for biohydrogen production from palm oil mill effluent", *International Journal of Hydrogen Energy*, 39(33), 19285–19293. http://doi: 10.1016/j.ijhydene.2014.05.139.

Nwuche, C. O., Aoyagi, H. and Ogbonna, J. C., 2014, "Treatment of Palm Oil Mill Effluent by a Microbial Consortium Developed from Compost Soils", *International Scholarly Research Notices*, 2014, 1–8. http://doi: 10.1155/2014/762070.

O-Thong, S., Suksong, W., Promnuan, K., Thipmunee, M., Mamimin, C., and Prasertsan, P., 2016, "Two-stage thermophilic fermentation and mesophilic methanogenic process for biohythane production from palm oil mill effluent with methanogenic effluent recirculation for pH control", *International Journal of Hydrogen Energy*, 41(46), 21702–21712. http://doi: 10.1016/j.ijhydene.2016.07.095.

Odum, E. P. (1993). Dasar-Dasar Ekologi. Penerjemah: Tjahyono Samingan, Yogyakarta: Gadjah Mada University Press.

Oktarina, E., Adrianto, R. and Setiawati, I., 2017, "Imobilisasi Bakteri pada

Kitosan-Alginat", *Majalah Teknologi Agro Industri (Tegi)*. 9(2), 1-6. http://ejournal.kemenperin.go.id/tegi

Onyla, C. O. Uyub, A. M., Akunna, J. C., Norulaini, N. A., and Omar, A. K. M., 2001, "Increasing the fertilizer value of palm oil mill sludge: Bioaugmentation in nitrification", *Water Science and Technology*, 44(10), 157–162. http://doi: 10.2166/wst.2001.0608.

Oschatz, M. and Antonietti, M., 2018, "A search for selectivity to enable CO2 capture with porous adsorbents", *Energy and Environmental Science*, 11(1), 57–70. http://doi: 10.1039/c7ee02110k.

Ozbayram, E. G., Ince, O., Ince, B., Harms, H., and Kleinsteuber, S., 2018, "Comparison of Rumen and Manure Microbiomes and Implications for the Inoculation of Anaerobic Digesters", *Microorganisms*, 6(1), 15. http://doi: 10.3390/microorganisms6010015.

Parawira, W. Murto, M., Zvauya, R., and Mattiasson, B., 2004, "Anaerobic batch digestion of solid potato waste alone and in combination with sugar beet leaves", *Renewable Energy*, 29(11), 1811–1823. http://doi: 10.1016/j.renene.2004.02.005.

Parawira, W. Murto, M., Zvauya, R., and Mattiasson, B., 2006, "Comparative performance of a UASB reactor and an anaerobic packed-bed reactor when treating potato waste leachate", *Renewable Energy*, 31(6), 893–903. http://doi: 10.1016/j.renene.2005.05.013.

Patel, H. and Madamwar, D. , 2002, "Effects of temperatures and organic loading rates on biomethanation of acidic petrochemical wastewater using an anaerobic upflow fixed-film reactor", *Bioresource Technology*, 82(1), 65–71. http://doi: 10.1016/S0960-8524(01)00142-0.

Pertiwiningrum, A., 2016, 'Instalasi Biogas', Yogyakarta: *CV.Kolom Cetak*.1-43.

Poh, P. E. and Chong, M. F., 2010, "Biomethanation of Palm Oil Mill Effluent (POME) with a thermophilic mixed culture cultivated using POME as a substrate", *Chemical Engineering Journal*, 164(1), 146–154. http://doi: 10.1016/j.cej.2010.08.044.

Poirier, S., Madigou, C., Bouchez, T., and Chapleur, O., 2017, "Improving anaerobic digestion with support media: Mitigation of ammonia inhibition and effect on microbial communities", Bioresource Technology, 235, 229–239. http://doi: 10.1016/j.biortech.2017.03.099.

Pörtner, R. and Faschian, R., 2019, Design and Operation of Fixed-Bed Bioreactors for Immobilized Bacterial Culture, *Growing and Handling of Bacterial Cultures*, Madhusmita Mishra', London: IntechOpen, 1-12. http://doi: 10.5772/intechopen.87944.

Prasertsan, P., O-Thong, S. and Birkeland, N. K., 2009, "Optimization and microbial community analysis for production of biohydrogen from palm oil mill effluent by thermophilic fermentative process", *International Journal of Hydrogen Energy*, 34(17), 7448–7459. http://doi: 10.1016/j.ijhydene.2009.04.075.

Purnomo, C. W., Mellyanawaty, M., and Budhijanto, W., 2017, "Simulation and Experimental Study on Iron Impregnated Microbial Immobilization in Zeolite for Production of Biogas", *Waste and Biomass Valorization*, 8(7), 2413–2421. http://doi: 10.1007/s12649-017-9879-z.

Ramadhani, L. I., Damayanti, S. I., Sudibyo, H., and Budhijanto, W., 2018, "Kinetics of Anaerobic Digestion of Palm Oil Mill Effluent (POME) in Double-Stage Batch Bioreactor with Recirculation and Fluidization of Microbial Immobilization Media", *IOP Conference Series: Materials Science and Engineering*, 316(1), 1-9. http://doi: 10.1088/1757-899X/316/1/012071.

Rizal, T. A., Mahidin and Ayyub, M., 2015, "Pengembangan Anaerobic Digester Untuk Produksi Biogas Dari Limbah Cair Pabrik Kelapa Sawit", *Jurutera*, 2(2), pp. 8–19. https://ejurnalunsam.id/index.php/jurutera/article/view/575.

Sasaki, K., Morita, M., Hirano, S.I., Ohmura, N., and Igarashi, Y., 2009, "Effect of Adding Carbon Fiber Textiles to Methanogenic Bioreactors Used to Treat an Artificial Garbage Slurry", *Journal of Bioscience and Bioengineering* 108 (2): 130–35. https://doi.org/10.1016/j.jbiosc.2009.03.003.

Sato, Y., Hamai, T., Hori, T. Aoyagi, T., Inaba, T., Kobayashi, M., Habe, H., and Sakata, T., 2019, "Desulfosporosinus spp. were the most predominant sulfate-reducing bacteria in pilot- and laboratory-scale passive bioreactors for acid mine drainage treatment", *Appl Microbiol Biotechnol* 103, 7783–7793. https://doi.org/10.1007/s00253-019-10063-2

Savi, G. D., Cardoso, W., Furtado, B., Bortolotlo, T., Angostin, L. O. V. D., Nones, J., Zanoni, E. T., Montedo, O. R. K., and Angioletto, E., 2017, "New ion-exchanged zeolite derivatives: Antifungal and antimycotoxin properties against Aspergillus flavus and aflatoxin B1", *Materials Research Express*, 4(8), 1–9. http://doi: 10.1088/2053-1591/aa84a5.

Seetharam, G. and Saville, B. A., 2002, "L-DOPA production from tyrosinase immobilized on zeolite', *Enzyme and Microbial Technology*, 31(6), 747–753. http://doi: 10.1016/S0141-0229(02)00182-5.

Shafie, N. F. A., Mansor, U. Q. A., Roslan, Q. I., Yahya, A., Manshor, N. M., Som, A. M., Nour, A. H., and Yunus, R. M., 2017, "An overview of anaerobic treatment processes performance treating palm oil mill effluent (POME)-past, present and future", *Advanced Science Letters*, 23(5), 4179–4183. http://doi:10.1166/asl.2017.8238.

Shuler, M.L., Kargi, F. (2002). Bioprocess Engineering, 2nd edn. Prentice-Hall, Inc., Upper Saddle River.

Singh, G., Jain, V. K. and Singh, A., 2017, "Effect of Temperature and other factors on Anaerobic Digestion Process, responsible for Bio Gas Production', *International Journal of Theoretical and Applied Mechanics*, 12(3), 637–657, http://www.ripublication.com/

Sivasubramanian, V., 2018, *Bioprocess Engineering for a Green Environment*, Florida: CRC Press. https://doi.org/10.1201/b22021

Slobodkina, G.B., Kovaleva, O.L., Miroshnichenko, M.L., Slobodkin, A.I. Kolganova, T.V., Novikov, A.A., Heerden, E., and Bonch-Osmolovskaya, E.A., 2014, "Thermogutta terrifontis gen. nov., sp. nov. and Thermogutta hypogea sp. nov., novel thermophilic anaerobic representatives of the phylum Planctomycetes'. *IJSEM Papers in Press*, 65, 760-765. http://doi:10.1099/ijs.0.000009.

Sorokin, D. Y., Abbas, B., Geleijnse, M., Kolganova, T. V., Kleerebezem, R., and van Loosdrecht, M. C. M., 2016, "Syntrophic associations from hypersaline soda lakes converting organic acids and alcohols to methane at extremely haloalkaline conditions", *Environmental Microbiology*, 18(9), 3189–3202. http://doi:10.1111/1462-2920.13448.

Speirs, Lachlan B.M., Rice, D.T.F., Petrovski, S., and Seviour, J., 2019, "The Phylogeny, Biodiversity, and Ecology of the Chloroflexi in Activated Sludge", *Frontiers in Microbiology* 10, 1-28 https://doi.org/10.3389/fmicb.2019.02015.

Sudibyo, H. Shabrina, Z. L., Wondah, H. R., Hastuti, R. T., Halim, L., Purnomo, C. W., and Budhijanto, W., 2018, "Anaerobic digestion of landfill leachate with natural zeolite and sugarcane bagasse fly ash as the microbial immobilization media in fixed bed reactor", *Acta Polytechnica*, 58(1), 57–68. http://doi:10.14311/AP.2018.58.0057.

Sun, L., Pope, P.B., Eijsink, V.G.H., and Schnirer, A., 2015, "Characterization of microbial community structure during continuous anaerobic digestion of straw and cow manure", *Microb Biotechnol* 8 (5), 815-827. https://doi.org/10.1111/1751-7915.12298.

Surendra, K. C. Takara, D., Hashimoto, A. G., and Khanal, S. K., 2014, "Biogas as a sustainable energy source for developing countries: Opportunities and challenges", *Renewable and Sustainable Energy Reviews*, 31, 846–859. http://doi: 10.1016/j.rser.2013.12.015.

Tajuddin, H. A., 2015), "Microbial Community Analysis in Anaerobic Palm Oil Mill Effluent (Pome) Wastewater By Denaturing Gradient Gel Electrophoresis (Dgge)", *International Journal of Research in Engineering and Technology*, 04(08), 1–9. http://doi: 10.15623/ijret.2015.0408001.

Tianjie A., Zhijie X., Pan Z., Xiaofeng, L., Liping, W., Dong, L., 2020, "Comparison of functional microbial profile between mesophilic and thermophilic anaerobic digestion of vegetable waste", *PREPRINT Research Square*. 1-25. https://doi.org/10.21203/rs.3.rs-54152/v1

Timmers, P. H. A., Vavourakis, C. D., Kleerebezem, R., Damsté, J. S. S., Muyzer, G., Stams, A. J. M., Sorokin, D.Y., Plugge, C. M., 2018, "Metabolism and Occurrence of Methanogenic and Sulfate-Reducing Syntrophic Acetate Oxidizing Communities in Haloalkaline Environments", *Frontiers in Microbiology*, 9. http://doi:10.3389/fmicb.2018.03039

Venkiteshwaran, K., Bocher, B., Maki, J., and Zitomer, D., 2015, "Relating Anaerobic Digestion Microbial Community and Process Function : Supplementary Issue: Water Microbiology", *Microbiology Insights*, 8(s2) 37–44. http://doi: 10.4137/mbi.s33593.

Verbelen, P. J., Schutter, D. P. D., Delvaux, F., Verstepen, K. J., and Delvaux, F. R., 2006, "Immobilized yeast cell systems for continuous fermentation applications", *Biotechnology Letters*, 28(19), 1515–1525. http://doi: 10.1007/s10529-006-9132-5.

Vítězová, M., Kohoutová, A., Vítěz, T., Hanišáková N., and Kushkevych I., 2020, "Methanogenic Microorganisms in Industrial Wastewater Anaerobic Treatment". *Processes*. 8(12):1546. https://doi.org/10.3390/pr8121546

Walter, A., Franke-White, I. H., Wagner, A. O., and Insam, H., 2015, "Methane yields and methanogenic community changes during co-fermentation of cattle slurry with empty fruit bunches of oil palm", *Bioresource Technology*, 175, 619–623. http://doi: 10.1016/j.biortech.2014.10.085.

Wang, Q., Yang, Y., Yu, C., Huang, H., Kim, M., Feng, C., and Zhang, Z., 2011, "Study on a fixed zeolite bioreactor for anaerobic digestion of ammonium-rich swine wastes', Bioresource Technology, 102(14), 7064–7068. http://doi:10.1016/j.biortech.2011.04.085.

Wang, X., Lu, X., Li, F., and Yang, G., 2014, "Effects of temperature and Carbon-Nitrogen (C/N) ratio on the performance of anaerobic co-digestion of dairy manure, chicken manure and rice straw: Focusing on ammonia inhibition", *PLoS ONE*, 9(5), 1-7. http://doi: 10.1371/journal.pone.0097265.

Wardani, N. A., 2020, Seleksi Inokulum untuk Peruraian Anaerob Termofilik Limbah Vinasse. Tesis: Universitas Gadjah Mada.

Weiß, S., A. Zankel, M. Lebuhn, S. Petrak, W. Somitsch, and G. M. Guebitz, 2011, "Investigation of Mircroorganisms Colonising Activated Zeolites during Anaerobic Biogas Production from Grass Silage", *Bioresource Technology* 102 (6), 4353–59. https://doi.org/10.1016/j.biortech.2010.12.076.

Wijesinghe, D. T. N., Dassanayake, K. B., Scales, P. J. Sommer, S. G., and Chen,

D., 2018, "Effect of Australian zeolite on methane production and ammonium removal during anaerobic digestion of swine manure", *Journal of Environmental Chemical Engineering*, 6(1), 1233–1241. http://doi:10.1016/j.jece.2018.01.028.

Willems, A., 2014, The Family Comamonadaceae, *The Prokaryotes*, Berlin: Springer-Verlag Berlin Heidelberg, 777–851. http://doi:10.1007/978-3-642-30197-1_238

Winanti, W. S., Prasetiyadi, P. and Wiharja, W., 2019, "Pengolahan Palm Oil Mill Effluent (POME) menjadi Biogas dengan Sistem Anaerobik Tipe tanpa Proses Netralisasi", *Jurnal Teknologi Lingkungan*, 20(1), 143. http://doi:10.29122/jtl.v20i1.3248.

Windiastuti, E., 2020, Komunitas Mikroorganisme dalam Reaktor Anaerobik Pembentukan Metana dari Vinasse pada Kondisi Termofilik dan Mesofilik, Tesis: Universitas Gadjah Mada.

Wu, F., Xu, X., Xie, J., Yi, S., Wang, J., Yang, X., and Qiu, S., 2016, "Molecular Characterization of Salmonella enterica Serovar Aberdeen Negative for H2S Production in China". *PLOS ONE*, 11(8), 1-11. http://doi:10.1371/journal.pone.0161352

Xia, Y., Wang, Y., Wang, Y., Chin, F. Y. L., and Zhang, T., 2016, "Cellular adhesiveness and cellulolytic capacity in Anaerolineae revealed by omics-based genome interpretation", *Biotechnol Biofuels* 9, 111, 1-13. https://doi.org/10.1186/s13068-016-0524-z

Yacob, S., Shirai, Y., Hassan, M. A., Wakisaka, M., and Subash, S., 2006, "Start-up operation of semi-commercial closed anaerobic digester for palm oil mill effluent treatment", *Process Biochemistry*, 41(4), 962–964. http://doi:10.1016/j.procbio.2005.10.021.

Yan, L., Ye, J., Zhang, P., Xu, D., Wu, Y., Liu, J., Zhang, H., Fang, W., Wang, B., and Zeng, G., 2018, "Hydrogen sulfide formation control and microbial competition in batch anaerobic digestion of slaughterhouse wastewater sludge: Effect of initial sludge pH", *Bioresource Technology*, 259, 67–74. http://doi:10.1016/j.biortech.2018.03.011

Yap, C. C., Loh, S. K., Chan, Y. J., Supramaniam, C. V., Chong, M. F., Soh, A. C., Lim, L, K., and Loo, L. S., 2021, "Synergistic effect of anaerobic co-digestion of palm oil mill effluent (POME) with Moringa oleifera extract", *Biomass and Bioenergy*, 144, 1-15. http://doi: 10.1016/j.biombioe.2020.105885.

Yeritsyan, H. N., Nickoghosyan, S. K., Sahakyan, A. A., Harutunyan, V. V., Hakhverdyan, E. A., and Grigoryan, N. E., 2008, "Comparative analyses of physical properties of natural zeolites from Armenia and USA, *Studies in Surface Science and Catalysis*, 2(1), 529–532. http://doi:10.1016/s0167-2991(08)80256-x

Younas, M. Sohail, M., Kong, L. L., JK Bashir, M., and Sethuphathi, S., 2016, "Feasibility of CO2adsorption by solid adsorbents: a review on low-temperature systems', *International Journal of Environmental Science and Technology*, 13(7), 1839–1860. http://doi: 10.1007/s13762-016-1008-1.

Zdarta, J. Meyer, A. S., Jesionowski, T., and Pinelo, M., 2018, "A general overview of support materials for enzyme immobilization: Characteristics, properties, practical utility", *Catalysts*, 8(2), 1-27. http://doi:10.3390/catal8020092.

Zhang, H., Xu, Y., Tian, Y., Zheng, L., Hao, H., and Huang, H., 2019, "Impact of Fe and Ni Addition on the VFAs' Generation and Process Stability of Anaerobic Fermentation Containing Cd", *International journal of environmental research and public health*, 16(21), 4066. https://doi.org/10.3390/ijerph16214066.

Zhang, J., Mao, L., Zhang, L., Loh, K. C., Dai, Y., and Tong, Y. W., 2017, "Metagenomic insight into the microbial networks and metabolic mechanism in anaerobic digesters for food waste by incorporating activated carbon", *Scientific reports*, 7(1), 1-10. https://doi.org/10.1038/s41598-017-11826-5.

Zhou, L. Li, G., An, T., Fu., Sheng, G., 2008, "Recent Patents on Immobilized Microorganism Technology and Its Engineering Application in Wastewater Treatment", *Recent Patents on Engineering*, 2(1), 28–35. http://doi:10.2174/187221208783478543.

Zhu, X., Chen, L., Chen, Y., Cao, Q., Liu, X., and Li, D., 2019, "Differences of methanogenesis between mesophilic and thermophilic in situ biogas-upgrading systems by hydrogen addition", *Journal of Industrial Microbiology & Biotechnology*, 46, 1569–1581. https://doi.org/10.1007/s10295-019-02219-w

Zucca, P. and Sanjust, E., 2014, "Inorganic materials as supports for covalent enzyme immobilization: Methods and mechanisms", *Molecules*, 19(9), 14139–14194. http://doi: 10.3390/molecules190914139.

Zur, J., Wojcieszyńska, D. and Guzik, U., 2016, "Metabolic responses of bacterial cells to immobilization", *Molecules*, 21(7), 1-15. http://doi:10.3390/molecules21070958.