

DAFTAR PUSTAKA

- A'yuni, N.R.L., Darmadji, P., Pranoto, Y., 2017. Asap Cair Kayu Sengon sebagai Chelating Agents Logam Timbal (Pb) pada Model Menggunakan Biji Kedelai. *J. Agro Sci.* 5, 42–51. <https://doi.org/10.18196/pt.2017.070.42-51>
- Aisahsari, R., Ermawati, F.U., 2019. Validitas dan Reliabilitas Instrumen Four-Tier Diagnostic Test untuk Materi Arus Listrik Searah. *Inov. Pendidik. Fis.* 08, 565–568.
- Akbar, A., Paindoman, R., Coniwanti, P., 2013. Pengaruh Variabel Waktu dan Temperatur terhadap Pembuatan Asap Cair dari Limbah Kayu Pelawan (Cyanometra Cauliflora). *J. Tek. Kim.* 19, 1–8.
- Alpian, A., Prayitno, T.A., Sutapa, J.P.G., Budiadi, B., 2014. Kualitas Asap Cair Batang Gelam (*Melaleuca* sp). *J. Penelit. Has. Hutan* 32, 83–92.
- Alvarez, J., Amutio, M., Lopez, G., Santamaria, L., Bilbao, J., Olazar, M., 2019. Improving Bio-oil Properties Through the Fast Co-pyrolysis of Lignocellulosic Biomass and Waste Tyres. *Waste Manag.* 85, 385–395. <https://doi.org/10.1016/j.wasman.2019.01.003>
- Anggraini, S.P.A., 2017. Teknologi Asap Cair dari Tempurung Kelapa, Tongkol Jagung, dan Bambu sebagai Penyempurna Struktur Kayu, in: Seminar Nasional Inovasi Dan Aplikasi Teknologi Di Industri, ITN Malang 4 Februari 2017. pp. 1–6.
- Anggraini, S.P.A., Yuniningsih, S., 2017. Teknologi Asap Cair Terhadap Kualitas Ikan Segar Selama Penyimpanan, in: Seminar Nasional Sistem Informasi (INASIF). pp. 931–941.
- Anggraini, S.P.A., Yuniningsih, S., 2013. Liquid Smoke Purification Process for Benzo (A) Pyrene Levels Lowering on Food Safety. *J. Agric. Food. Tech* 3, 1–4.

- Apriani, R., Ferasyi, R., Razali, R., 2017. Microbial Contamination Numbers and Organoleptic Value of Tuna Fish (*Euthynnus affinis*) Ria. *JIMVET* 01, 598–603.
- Aprilia, K., Kusnadi, D., Harniati, 2020. Persepsi Petani Padi Terhadap Sistem Tanam Jajar Legowo Di Desa Sukaharja Kecamatan Ciomas Kabupaten Bogor. *J. Inov. Penelit.* 1, 435–444.
- Archana, A., Vijay Pradhap Singh, M., Chozhavendhan, S., Gnanavel, G., Jeevitha, S., Muthu Kumara Pandian, A., 2020. Coconut Shell as a Promising Resource for Future Biofuel Production. *Energy, Environ. Sustain.* 31–43. https://doi.org/10.1007/978-981-15-0410-5_3
- Arifin, H.S., Fuady, I., Kuswarno, E., 2017. Factor Analysis That Effect University Student Perception In Untirta About Existence Of Region Regulation in Serang City. *J. Penelit. Komun. Opini Publik* 21, 88–101.
- Asmawit, A., Hidayati, H., Supriyatna, N., 2011. Pemanfaatan Asap Cair Dari Tandan Kosong Kelapa Sawit Pada Pengolahan Karet Mentah. *Biopropal Ind.* 02, 7–12.
- Ayudiarti, D.L., Sari, R.N., 2010. Asap cair dan aplikasinya pada produk perikanan. *Squalen* 5, 101–108.
- Balat, Mustafa, Balat, Mehmet, Kırtay, E., Balat, H., 2009. Main routes for the thermo-conversion of biomass into fuels and chemicals . Part 1 : Pyrolysis systems. *Energy Convers. Manag.* 50, 3147–3157. <https://doi.org/10.1016/j.enconman.2009.08.014>
- Belitz, H., Grosch, W., Schieberle, P., 2009. *Food Chemistry*, 4 th. ed. Springer, Germany. <https://doi.org/10.1007/978-3-540-69934-7>
- Bhattacharya, A., Kumar, P., 2010. Water Hyacinth as a Potential Biofuel Crop. *Electron. J. Environ. Agric. Food Chem.* 9, 112–122.

- Bote, M.A., Naik, V.R., Jagadeeshgouda, K.B., 2020. Materials Science for Energy Technologies Review on water hyacinth weed as a potential bio fuel crop to meet collective energy needs. *Mater. Sci. Energy Technol.* 3, 397–406. <https://doi.org/10.1016/j.mset.2020.02.003>
- Bridgwater, A., Gerhauser, H., Effendi, A., 2008. Biomass Pyrolysis.
- Budaraga, I.K., Marlida, Y., Bulanin, U., 2016. Toxicity of Liquid Smoke Cinnamon (*Cinnamomum Burmannii*) Production of Ways for Purification and Different Concentration. *Int. J. Sci. Res. Publ.* 6, 13–21.
- Ceylan, Z., Sengor, G.F.U., Yilmaz, M.T., 2018. Nanoencapsulation of Liquid Smoke/thymol Combination in Chitosan Nano Fibers to Delay Microbiological Spoilage of Sea Bass (*Dicentrarchus labrax*) fillets. *J. Food Eng.* 229, 43–49. <https://doi.org/10.1016/j.jfoodeng.2017.11.038>
- Chaerul, M., Allia, V., 2020. Tinjauan Kritis Studi Life Cycle Assessment (LCA) di Indonesia. *Serambi Eng.* V, 816–823.
- Chan, Y.H., Yusup, S., Quitain, A.T., Uemura, Y., Loh, S.K., 2017. Biomass and Bioenergy Fractionation of pyrolysis oil via supercritical carbon dioxide extraction : Optimization study using response surface methodology (RSM). *Biomass and Bioenergy* 107, 155–163. <https://doi.org/http://dx.doi.org/10.1016/j.biombioe.2017.10.005>
- Chowdhury, Z.Z., Pal, K., Yehye, W., Suresh, S., 2017. Pyrolysis : A Sustainable Way to Generate Energy from Waste, in: *World ' s Largest Science , Technology & Medicine.* pp. 1–36. <https://doi.org/10.5772/intechopen.69036>
- Damongilala, L.J., 2009. Moisture Content and Total Bacteria in Smoked Roa (*Hemirhampus Sp*) with Different Raw Material Washing Methods. *J. Ilm. Sains* 9, 190–198.
- Das, S., Goud, V. V., 2021. RSM-optimised slow pyrolysis of rice husk for bio-oil production and its upgradation. *Energy* 225, 1–10. <https://doi.org/https://doi.org/10.1016/j.energy.2021.120161>

- Dean, A., Voss, D., Draguljic, D., 2017. Design and Analysis of Experiments, 2 nd. ed. Springer International Publishing AG, Switzerland.
- Demirbas, A., 2007. The influence of temperature on the yields of compounds existing in bio-oils obtained from biomass samples via pyrolysis. *Fuel Process. Technol.* 88, 591–597. <https://doi.org/10.1016/j.fuproc.2007.01.010>
- Desniorita, Maryam, 2015. The effect of Adding Liquid Smoke Powder to Shelf Life of Sauce. *Int. J. Adv. Sci. Eng. Inf. Technol.* 5, 457–9. <https://doi.org/10.18517/ijaseit.5.6.576>
- Desvita, H., Faisal, M., Mahidin, Suhendrayatna, 2020. Preservation of Meatballs with Edible Coating of Chitosan Dissolved in Rice Hull-Based Liquid Smoke. *Heliyon* 6, 1–6. <https://doi.org/10.1016/j.heliyon.2020.e05228>
- Dickerson, T., Soria, J., 2013. Catalytic Fast Pyrolysis: A Review. *energies* 6, 514–538. <https://doi.org/10.3390/en6010514>
- Dotulong, V., Patty, C.N., Suwetja, I.K., 2018. Quality Smoked Roa (Hemirhamphus Sp) Sold at Bersehati Market, Manado City, North Sulawesi. *J. Media Teknol. Has. Perikan.* 6, 281–286.
- Efendi, A., Ciptomulyono, U., 2010. Implementasi Life Cycle Assessment (LCA) dan Analytical Network Process (ANP) untuk Manajemen Lingkungan pada PT. Charoen Pokphand - Krian. *Jurnal Tek. ITS* 1, 1–6.
- Erlytasari, D.N., Wibisono, G., Hapsari, R., dkk, 2019. Efektivitas Asap Cair Berbagai Konsentrasi Sebagai Disinfektan Alat Klinik Gigi. *J. Kedokt. Diponegoro* 8, 1114–1123.
- Fachraniah, F., Fona, Z., Rahmi, Z., Dkk, 2009. Peningkatan Kualitas Asap Cair dengan Distilasi. *J. Reaksi (Journal Sci. Technol.* 7, 1–11.
- Fadillah, H., Alfiarty, A., 2015. The Influence Of Pyrolysis Temperature And Time To The Yield And Quality of Rubber Fruit (*Hevea brasiliensis*) Shell Liquid Smoke, in: Pengembangan Teknologi Kimia Untuk Pengolahan Sumber Daya

Alam Indonesia. pp. 1–7.

Fagemas, L., 1995. Chemical and physical characterisation of biomass-based pyrolysis oils. *Julkaisija - Utgivare - Publisher, Finland*.

Faisal, M., Sunarti, A.R.Y., Desvita, H., 2018. Characteristics Of Liquid Smoke From The Pyrolysis Of Durian Peel Waste At Moderate Temperatures. *Rasayan J. Chem.* 11, 871–876.

Fan, J., Kalnes, T.N., Alward, M., Klinger, J., Sadehvandi, A., Shonnard, D.R., 2011. Life cycle assessment of electricity generation using fast pyrolysis bio-oil. *Renew. Energy* 36, 632–641. <https://doi.org/10.1016/j.renene.2010.06.045>

Fauziati, F., Priatni, A., Adiningsih, Y., 2018. Pengaruh berbagai suhu pirolisis asap cair dari cangkang sawit sebagai bahan penggumpal lateks. *J. Ris. Teknol. Ind.* 12, 139–149.

Firman, M.A.A., Bahri, S., Khairat, K., 2016. Pirolisis Biomassa Kayu Pinus (Wood Pine) Dengan Katalis Mo/Lempung Menjadi Bio-Oil. *Jom F. Tek.* 3, 1–11.

Ginayati, L., Faisal, M., Suhendrayatna, 2015. Utilization of liquid smoke from the pyrolysis of oil palm shells as a natural preservative of tofu. *J. Chem. Eng. USU* 4, 7–11.

Ginting, A.S., Tambunan, A.H., Setiawa, R.P.A., 2015. Karakteristik gas-gas hasil pirolisis tandan kosong kelapa sawit. *J. Teknol. Ind. Pertan.* 25, 158–163.

Gunamantha, M., Fandeli, C., Tandjung, S.D., Sarto, 2010. Life Cycle Assessment Pilihan Pengelolaan Sampah : Studi Kasus Wilayah Kartamantul Propinsi D.I. Yogyakarta. *J. Mns. DAN Lingkungan.* 17, 78–88.

Hadanu, R., Ambrosius, D., Apituley, N., 2016. Volatile Compounds Detected in Coconut Shell Liquid Smoke through Pyrolysis at a Fractioning Temperature of 350-420 C. *Makara J. Sci.* 20, 95–100. <https://doi.org/10.7454/mss.v20i3.6239>

- Hadiyanto, H., Sutrisnorhadi, S., 2016. Response surface optimization of ultrasound assisted extraction (UAE) of phycocyanin from microalgae *Spirulina platensis*. *Emirates J. Food Agric.* 28, 227–234. <https://doi.org/10.9755/ejfa.2015-05-193>
- Haji, A.G., Alim, Z., Lay, B.W., Sutjahjo, S.H., Pari, G., dkk, 2007. Karakteristik Asap Cair Hasil Pirolisis Sampah Organik Padat. *J. Tek. Ind. Pertan.* 16, 111–118.
- Hakim, A.M., Darusman, D., 2015. Persepsi, sikap, dan partisipasi masyarakat dalam pengelolaan hutan mangrove di Wonorejo, Surabaya, Jawa Timur. *Bonorowo Wetl.* 5, 85–93. <https://doi.org/10.13057/bonorowo/w050204>
- Hardianto, L., Yunianta, 2015. The Effect of Liquid Smoke on Chemical And Organoleptic Of Tuna (*Euthynnus affinis*). *J. Pangan dan Agroindustri* 3, 1356–1366.
- Hartati, S., Darmadji, P., Pranoto, Y., 2015. Penggunaan Asap Cair Tempurung Kelapa untuk Menurunkan Kadar Timbal (Pb) pada Biji Kedelai (*Glycine max*). *J. Agritech* 35, 331. <https://doi.org/10.22146/agritech.9345>
- Hasanah, U., Setiaji, B., Anwar, C., 2012. The Chemical Composition and Physical Properties of the Light and Heavy Tar Resulted from Coconut Shell Pyrolysis 1, 26–32.
- Hendrawan, Y., Susilo, B., Putranto, A.W., Riza, D.F. Al, Maharani, D.M., Amri, M.N., 2016. Optimasi dengan Algoritma RSM-CCD pada Evaporator Vakum Waterjet dengan Pengendali Suhu Fuzzy pada Pembuatan Permen Susu. *Agritech* 36, 226–232.
- Herwati, E., Prarudianto, A., Saloko, S., Mataram, U., 2017. Pengaruh Konsentrasi Bubuk Asap Cair Tempurung Kelapa (*Cocos Nucifera* Linn) dan Lama Penyimpanan Terhadap Kualitas Bandeng Presto Asap. *J. Ilm. Rekayasa Pertan. dan Biosist.* 5, 348–359.

- Hidayah, A.M., Retnaningsih, T., 2014. Biokonsentrasi Faktor Logam Berat Pb , Cd , Cr dan Cu pada Ikan Nila (*Oreochromis niloticus* Linn .) di Karamba Danau Rawa Pening. *Bioma* 16, 1–9.
- Hidayat, T., Qomarudin, Q., 2015. Analisa Pengaruh Temperatur Pirolisis Dan Bahan Biomassa Terhadap Kapasitas Hasil Pada Alat Pembuat Asap Cair, in: *Prosiding SNST Ke 6 Tahun 2015*. pp. 29–34.
- Hu, Q., Tang, Z., Yao, D., Yang, H., Shao, J., Chen, H., 2020. Thermal behavior , kinetics and gas evolution characteristics for the co- pyrolysis of real-world plastic and tyre wastes. *J. Clean. Prod.* 260, 121102. <https://doi.org/10.1016/j.jclepro.2020.121102>
- Hu, Y., Yu, W., Wibowo, H., Xia, Y., Lu, Y., Yan, M., 2019. Science of the Total Environment Effect of catalysts on distribution of polycyclic-aromatic hydrocarbon (PAHs) in bio-oils from the pyrolysis of dewatered sewage sludge at high and low temperatures. *Sci. Total Environ.* 667, 263–270. <https://doi.org/10.1016/j.scitotenv.2019.02.320>
- Ifa, L., Yani, S., Mandasini, M., Sabar, Z., Nurjanah, N., Rusnaenah, A., 2018. Production of Phenol From Liquid Smoke Resulted by the Pyrolysis of Cashew Nut Shells, in: *Earth and Environmental Science PAPER*. pp. 1–5.
- Ilmawati, W., Jahiding, M., Musnina, W., 2020. Pyrolysis Temperature Effect on Volume and Chemical Composition of Liquid Volatile Matter of Durian Shell, in: *Towards The Extended Use Of Basic Science For Enhancing Health, Environment, Energy And Biotechnology*. pp. 273–275.
- Indrayati, A., Hikmah, N.I., 2018. Prediksi Sedimen Danau Rawa Pening Tahun 2020 Sebagai Dasar Reservasi Sungai Tuntang Berbasis Sistem Informasi Geografis, in: *Prosiding Seminar Nasional Geografi UMS IX 2018; Restorasi Sungai: Tantangan Dan Solusi Pembangunan Berkelanjutan*. pp. 543–552.
- Iribarren, D., Peters, J.F., Dufour, J., 2012. Life cycle assessment of transportation fuels from biomass pyrolysis. *Fuel* 97, 812–821.

<https://doi.org/10.1016/j.fuel.2012.02.053>

- Istadi, I., Anggoro, D.D., Marwoto, P., Suherman, S., Nugroho, B.T., 2009. Biodiesel Production from Vegetable Oil over Plasma Reactor: Optimization of Biodiesel Yield using Response Surface Methodology. *Bull. Chem. React. Eng. Catal.* 4, 23–31.
- Jamaluddin, M.A., Ismail, K., Ishak, M.A.M., Ghani, Z.A., Abdullah, M.F., Safian, M.T.U., Idris, S.S., Tahiruddin, S., Yunus, M.F.M., Hakimi, N.I.N.M., 2013. Microwave-assisted pyrolysis of palm kernel shell: Optimization using response surface methodology (RSM). *Renew. Energy* 55, 1–9.
- Jayudini, J., Suhendi, E., Uyun, J., Supriatna, A.H., dkk, 2012. Pengaruh Suhu Pirolisis dan Ukuran Tempurung Kelapa Terhadap Rendemen dan karakteristik Asap Cair sebagai Pengawet Alami. *J. Sain dan Teknol. Tek.* 8, 46–55.
- Jiu, B., Li, B., Yu, Q., 2015. Effects of Pb on pyrolysis behavior of water hyacinth. *J. Anal. Appl. Pyrolysis* 112, 270–275. <https://doi.org/10.1016/j.jaap.2015.01.015>
- Kadir, S., Darmadji, P., Hidayat, C., Supriyadi, 2010. Fraksinasi dan identifikasi senyawa volatil pada asap cair tempurung kelapa hibrida. *Agritech* 30, 57–67.
- Kan, T., Strezov, V., Evans, T.J., 2016. Lignocellulosic Biomass Pyrolysis : A Review of Product Properties and Effects of Pyrolysis Parameters. *Renew. Sustain. Energy Rev.* 57, 1126–1140. <https://doi.org/10.1016/j.rser.2015.12.185>
- Kasim, F., Fitriah, A.N., Hambali, E., 2015. Aplikasi Asap Cair Pada Lateks. *Pasti* IX, 28–34.
- Keryanti, Permanasari, A.R., Yulistiani, F., Sihombing, R.P., Wibisono, W., 2020. Applications of Liquid Smoke from Biomass on Food Products: A Review, in: *International Seminar of Science and Applied Technology (ISSAT 2020)*. pp. 518-524 [In Indonesia]. <https://doi.org/10.2991/aer.k.201221.086>

- Ketut, P., Kencana, D., 2020. Pengaruh Suhu dan Lama Pengovenan Ikan Tongkol yang direndam dalam Larutan Asap Cair Batang Bambu Tabah terhadap Karakteristik Produk Ikan Olahan Effect. *J. beta (Biosistem dan Tek. Pertanian)* 8, 158–166.
- Khamidah, S., Swastawati, F., Romadhon, R., 2019. Effects of Different Dipping Duration into Durian Skin Liquid Smoke on the Quality of Catfish (*Arius thalassinus*) Smoked. *J. Ilmu dan Teknol. Perikan.* 1, 21–29.
- Khor, K.H., Lim, K.O., Zainal, Z.A., 2009. Characterization of bio-oil: A by-product from slow pyrolysis of oil palm empty fruit bunches. *Am. J. Appl. Sci.* 6, 1647–1652. <https://doi.org/10.3844/ajassp.2009.1647.1652>
- Kresnawaty, I., Putra, S.M., Budiani, A., Darmono, T.W., 2017. Converting Empty Palm Oil Bunches (TKKS) into Bio Charcoal and Liquid Smoke. *J. Penelit. Pascapanen Pertan.* 14, 171–179.
- Kumar, B.R., Saravanan, S., Kumar, R.N., Nishanth, B., Rana, D., Nagendran, A., 2016. Effect of lignin-derived cyclohexanol on combustion , performance and emissions of a direct-injection agricultural diesel engine under naturally aspirated and exhaust gas recirculation (EGR) modes. *FUEL* 181, 630–642. <https://doi.org/10.1016/j.fuel.2016.05.052>
- Ledesma, B., Alvarez, A., Rom, S., Coronella, C., Qaramaleki, S. V, 2020. Suitability of hydrothermal carbonization to convert water hyacinth to added-value products. *Renew. Energy J.* 146, 1649–1658. <https://doi.org/10.1016/j.renene.2019.07.157>
- Lee, K.M., Inaba, A., 2004. Life Cycle Assessment Best Practices of ISO Series. Committee on Trade and Investment.
- Lestari, Y.I., Idiawati, N., Harlia, H., 2015. Aktivitas Antibakteri Asap Cair Tandan Kosong Sawit Grade 2 Yang Sebelumnya Diadsorpsi Zeolit Teraktivasi. *JKK* 4, 45–52.
- Lewandowski, W.M., Januszewicz, K., Kosakowski, W., 2019. Efficiency and

proportions of waste tyre pyrolysis products depending on the reactor type — A review. *J. Anal. Appl. Pyrolysis* 140, 25–53. <https://doi.org/10.1016/j.jaap.2019.03.018>

Li, S., Nie, Z., Tian, Y., Liu, C., 2019. Liquid Refractive Index Measurement System Based on Electrowetting Lens 1–9.

Lin, H., Rong, C., Jiu, B., Li, B., Yu, Q., Gan, L., Zhang, Z., 2018. Effects of Chromium on Pyrolysis Characteristic of Water Hyacinth (*Eichornia crassipes*). *Renew. Energy* 115, 676–684. <https://doi.org/10.1016/j.renene.2017.08.045>

Lombok, J., Setiaji, B., Trisunaryati, W., Wijaya, K., dkk, 2014. Effect of Pyrolysis Temperature and Distillation on Character of Coconut Shell Liquid Smoke. *Asian J. Sci. Technol.* 5, 320–325.

M. Yunus, 2011. Teknologi Pembuatan Asap Cair dari Tempurung kelapa sebagai Pengawet Makanan. *J. Sains dan Inov.* 7, 53–61.

Machbub, B., Suwanto, A., Novitha, H.T., Manurung, H., Retnowati, I., Rachmiati, S., Rustadi, W.C., 2012. Daya Tampung Beban Pencemaran Air dan Zonasi Danau Rawa Pening. Kementerian Lingkungan Hidup, Jakarta.

Mardyaningsih, M., Leki, A., Engel, S.S., 2016. Technology of Making Liquid Smoke of Kesambi Leaves as an Ingredients for Fumigating Se'i Fish Processed Typical of East Nusa Tenggara, in: *Chemical Technology Development for Natural Resource Processing in Indonesia*. pp. 1–6.

Martillanes, S., Pimienta, J.R., Manuel, C.B., Vertedor, D.M., Jonathan, D.A., 2017. Application of Phenolic Compounds for Food Preservation: Food Additive and Active Packaging, in: *Phenolic Compounds*. pp. 2–21.

Martinez, J.D., Puy, N., Murillo, R., Garcí'a, T., Navarro, M.V., Mastral, A.M., 2013. Waste tyre pyrolysis – A review. *Renew. Sustain. Energy Rev.* 23, 179–213. <https://doi.org/10.1016/j.rser.2013.02.038>

- Marzuki, P.F., Abduh, M., Driejana, R., 2013. Peran Life Cycle Analysis (LCA) Pada Material Konstruksi Dalam Upaya Menurunkan Dampak Emisi Karbon Dioksida Pada Efek Gas Rumah Kaca 7, 24–26.
- Maulina, S., Putri, F.S., 2017. Pengaruh Suhu , Waktu , dan Kadar Air Bahan Baku terhadap Pirolisis Serbuk Pelepeh Kelapa Sawit. *J. Tek. Kim. USU* 6, 35–40.
- Melo, M.M.R. De, Silva, R.P., Silvestre, A.J.D., Silva, C.M., 2016. Valorization of water hyacinth through supercritical CO₂ extraction of stigmasterol. *Ind. Crops Prod.* 80, 177–185.
- Mohseni-bandpei, A., Majlesi, M., Rafiee, M., Nojavan, S., Nowrouz, P., Zolfagharpour, H., 2019. Polycyclic aromatic hydrocarbons (PAHs) formation during the fast pyrolysis of hazardous health-care waste. *Chemosphere* 227, 1–12.
- Montazeri, N., Oliveira, A.C.M., Himelbloom, B.H., Leigh, M.B., Crapo, C.A., 2013a. Chemical characterization of commercial liquid smoke products. *Food Sci. Nutr.* 1, 102–115. <https://doi.org/10.1002/fsn3.9>
- Montazeri, N., Oliveira, A.C.M., Himelbloom, B.H., Leigh, M.B., Crapo, C.A., 2013b. Chemical characterization of commercial liquid smoke products. *Food Sci. Nutr.* 1, 102–115. <https://doi.org/10.1002/fsn3.9>
- Montazeri, N., Oliveira, A.C.M., Himelbloom, B.H., Leigh, M.B., Crapo, C.A., 2012. Chemical characterization of commercial liquid smoke products. *Food Sci. Nutr.* 1, 102–115. <https://doi.org/10.1002/fsn3.9>
- Moradi, M., Fazlzadehdavil, M., Pirsaeheb, M., Mansouri, Y., Khosravi, T., Sharafi, K., 2016. Response surface methodology (RSM) and its application for optimization of ammonium ions removal from aqueous solutions by pumice as a natural and low cost adsorbent. *Arch. Environ. Prot.* 42, 33–43. <https://doi.org/10.1515/aep-2016-0018>
- Mustafiah, Makhsud, A., Aladin, A., 2016a. Pengaruh Suhu Terhadap Produksi Asap Cair dari Blending Limbah Biomassa Cangkang Sawit dengan Batubara

secara Pirolisis. *J. Chem. Process Eng.* 1, 1.
<https://doi.org/10.33536/jcpe.v1i1.45>

Mustafiah, Makhsud, A., Aladin, A., 2016b. Pengaruh Suhu Terhadap Produksi Asap Cair dari Blending Limbah Biomassa Cangkang Sawit dengan Batubara secara Pirolisis. *J. Chem. Process Eng.* 01, 1–8.

Ningsih, Y.W., Kurniawan, T., Rahmawati, A.N., Permatasari, D.A., Ghunarso, D.A., Pratama, R.A., Mei, A., 2019. Public Perception of Water Hyacinth Plants Rawa Pening in Banyubiru Village, Semarang Regency. *J. Geogr. Edukasi dan Lingkungan.* 3, 22–30.

Nithin C.T., Joshya, C.G., Chatterjee, N.S., Panda, S.K., Yathavamoorthi, R., Ananthanarayanan, T.R., Mathew, S., Bindua, J., Gopal, T.K.S., 2020. Liquid Smoking - A safe and Convenient Alternative for Traditional Fish Smoked Products. *Food Control* 113, 107186.
<https://doi.org/10.1016/j.foodcont.2020.107186>

Nontji, A., 2016. *Danau Danau Alami*, 1st ed. Kementerian Lingkungan Hidup, Jakarta.

Noor, E., Luditama, C., Pari, G., 2006. Isolasi dan pemurnian asap cair berbahan dasar tempurung dan sabut kelapa secara pirolisis dan distilasi, in: *Prosiding Konferensi Nasional Kelapa*. pp. 93–102.

Novita, S.A., Djinis, M.E., Melly, S., Putri, S.K., 2014. Processing Coconut Fiber and Shell to Biodiesel. *Int. J. Adv. Sci. Eng. Inf. Technol.* 4, 84–86.

Nugroho, A.S., Tanjung, S.D., Hendrarto, B., 2012. Kondisi Fisiografi Dan Fisiko-Kimia Perairan Pada Zona Littoral Danau Rawa Pening.

Nurkholis, N., Jamilatun, S., 2016. Pengaruh Luas Perpindahan Panas Kondensor Terhadap Volume Asap Cair Terkondensasi Hasil Pirolisis Tempurung Kelapa. *Chemica* 3, 61–65.

- Nurrassyidin, N., Idral, I., Zultiniar, Z., dkk, 2014. Pengaruh Variasi Temperatur Dan Waktu Terhadap Rendemen Pirolisis Limbah Kulit Durian Menjadi Asap Cair. *Jom F. Tek.* 1, 1–8.
- O zeler, U., Yetis, U., Demirer, G., 2006. Life cycle assesment of municipal solid waste management methods : Ankara case study. *Environ. Int.* 32, 405–411. <https://doi.org/10.1016/j.envint.2005.10.002>
- Oasmaa, A., Peacocke, C., 2001. A guide to physical property characterisation of biomass-derived fast pyrolysis liquids. *VTT Publ.* 2–65.
- Oramahi, H., 2016. Optimasi dengan RSM dan Rancangan Percobaan, 1st ed. Gava Media, Yogyakarta.
- Ozbay, G., 2015. Pyrolysis of Firwood (*Abies bornmülleriana* Mattf) Sawdust : Characterization of Bio-Oil and Bio-Char. *Drv. Ind.* 66, 105–114. <https://doi.org/10.5552/drind.2015.1359>
- Ozbay, G., Ayrimis, N., 2017. Effect of Pyrolysis Temperature On Bio-Oil Production From vacuum Pyrolysis of Waste Froom Wood Industry, in: *Proceedings of 117th The IIER International Conference, Helsinki, Finland, 17th-18th August 2017.* pp. 56–58.
- Özbay, G., Özçifçi, A., Kökten, E.S., 2016. The Pyrolysis Characteristics of Wood Waste Containing Different Types of Varnishes. *Turkish J. Agric. For.* 40, 705–714. <https://doi.org/10.3906/tar-1502-88>
- Palupi, A.H., Tama, I.P., Sari, R.A., 2012. Evaluasi Dampak Lingkungan Produk Kertas Dengan Menggunakan Life Cycle Assessment (LCA) Dan Analytic Network Process (ANP). *J. Rekayasa dan Manaj. Sist. Ind.* 2, 1136–1147.
- Pamori, R., Efendi, R., Restuhadi, F., dkk, 2015. Karakteristik Asap Cair dari Proses Pirolisis Limbah Sabut Kelapa Muda. *Sagu* 14, 43–50.
- Parthasarathy, P., Choi, H.S., Park, H.C., Hwang, J.G., Yoo, H.S., Lee, B., Upadhyay, M., 2016. Influence of process conditions on product yield of waste

tyre pyrolysis- A review. *Korean J. Chem. Eng* 33, 2268–2286.
<https://doi.org/10.1007/s11814-016-0126-2>

Permatasari, R.N.S., Purnawati, R.D., Wijayahadi, N., 2019. Pengaruh Pemberian Asap Cair Dosis Bertingkat terhadap Penyembuhan Luka Bakar Derajat Dua Dangkal pada Kelinci (*Oryctolagus Cuniculus*). *J. Kedokt. Diponegoro* 8, 436–445.

Piranti, A., Waluyo, G., Rahayu, D.R.U., 2019. The possibility of using Lake Rawa Pening as a source of drinking water. *J. Environ. Manage.* 41, 111–119.
<https://doi.org/10.2478/jwld-2019-0034>

Prasetyo, S., Anggoro, S., Soeprbowati, T.R., 2021a. The Growth Rate of Water Hyacinth (*Eichhornia crassipes* (Mart.) Solms) in Rawapening Lake, Central Java. *J. Ecol. Eng.* 22, 222–231.

Prasetyo, S., Anggoro, S., Soeprbowati, T.R., 2021b. The Growth Rate of Water Hyacinth (*Eichhornia Crassipes* (Mart.) Solms) in Rawapening Lake, Central Java. *J. Ecol. Eng.* 22, 222–231. <https://doi.org/10.12911/22998993/137678>

Pratiwi, F.D., Zainuri, M., Purnomo, P.W., Purwati, F., 2018. Stakeholder Perception and Participation in Relation to Success Rate of Water Wyacinth Control Program in the Rawa Pening Lake. *AACL Bioflux* 11, 967–979.

Pujihastuti, I., 2010. Prinsip Penulisan Kuesioner Penelitian. *Jurnal Agribisnis dan Pengemb. Wil.* 2, 43–56.

Purba, R., Suseno, S.H., Fitri Izaki, A., Muttaqin, S., 2014. Application of Liquid Smoke and Chitosan as Natural Preservatives for Tofu and Meatballs. *Int. J. Appl. Sci. Technol.* 4, 212–217.

Puspitasari, M., Sutijan, S., Budiman, A., 2016. Kinetika Reaksi Pirolisis Enceng Gondok. *Eksergi* 13, 13–16.

Putri, A.S., 2013. Keselamatan Dan Kesehatan Kerja Sebelum Dan Sesudah Penerapan. *J. Bisnis Strateg.* 22, 67–94.

- Radhakrishnan, C., Natarajan, K., Azhagendran, K., Mohanlal, K., Ponraj, P., Nivas, R., 2016a. Experimental Analysis of Bio-Oil from Coconut Shell and Front by Continuous Pyrolysis Process 4841–4846. <https://doi.org/10.15680/IJIRSET.2016.0504034>
- Radhakrishnan, C., Natarajan, K., Azhagendran, K., Mohanlal, K., Ponraj, P., Nivas, R., 2016b. Experimental Analysis of Bio-Oil from Coconut Shell and Front by Continuous Pyrolysis Process. *Int. J. Innov. Res. Sci. Eng. Technol.* 5, 4841–4846. <https://doi.org/10.15680/IJIRSET.2016.0504034>
- Ramakrishnan, S., Moeller, P., 2002. Liquid Smoke : Product Of Hardwood Pyrolysis. *Fuel Chem. Div. Prepr.* 47, 366–367.
- Ratnani, R.D., 2012. Kemampuan Kombinasi Eceng Gondok Dan Lumpur Aktif Untuk Menurunkan Pencemaran Pada Limbah Cair Industri Tahu. *Momentum* 8, 1–5.
- Ratnani, R.D., 2005. Proses Pirolisis Eceng Gondok (*Eichhornia Crassipes*) Menjadi Karbon Aktif dengan Bahan Pengaktif Natrium Klorida (NaCl). *Momentum* 1, 5–10.
- Ratnani, R.D., Hadiyanto, H., Widiyanto, W., 2021. Effect of Temperature and Pyrolysis Time in Liquid Smoke Production from Dried Water Hyacinth. *J. Environ. Treat. Teh.* 9, 164–171.
- Ratnani, R.D., Widiyanto, W., 2018. A Review of Pyrolysis of Eceng Gondok (Water hyacinth) for Liquid Smoke, in: *Es3 WEB.* pp. 2–6.
- Ratnawati, R., Hartanto, S., 2010. Effect of Palm Shell Pyrolysis Temperature on Quantity and Quality of Liquid Smoke. *Indones. J. Mater. Sci.* 12, 7–11.
- Ratnawati, S.E., Ekantari, N., Pradipta, R.W., Paramita, B.L., 2018. The Application of Response Surface Methodology (RSM) on the Optimization of Catfish Bone Calcium Extraction. *J. Perikan. Univ. Gadjah Mada* 20, 41–48.
- Republik Indonesia, 2011. Profil 15 Danau Prioritas Nasional, Kementerian

Lingkungan Hidup.

Republik Indonesia, 2009. Undang-Undang Republik Indonesia Nomor 32 Tahun 2009 tentang Perlindungan dan Pengelolaan Lingkungan Hidup.

Rinaldi, A., Alimuddin, A., Panggabean, A.S., Dkk, 2015. Pemurnian Asap Cair Dari Kulit Durian Dengan Menggunakan Arang Aktif (Purification of Liquid Smoke From Durian Peel'S With Activated Charcoal). *Molekul* 10, 112–120.

Riyanti, F., Loekitowati, P., Yuliasari, N., Hidayati, N., Eliza, 2013. Pembuatan Instalasi Untuk Biogas Dari Enceng Gondok (*Eichhornia Crassipes*) Yang Efisien Untuk Lahan Kecil Fahma. *J. Pengabd. Sriwij.* 215–221.

Rompas, R., Tulung, B., Mandey, J.S., Regar, M., 2016. Penggunaan Eceng Gondok (*Eichhornia Crassipes*) Terfermentasi Dalam Ransum Itik Terhadap Kecernaan Bahan Kering Dan Bahan Organik. *J. Zootek ("Zootek"Jurnal* 36, 372–378.

Sadaka, S., Boateng, A.A., 2017a. Pyrolysis and Bio Oil. *Agric. Nat. Resour.* 1–25.

Sadaka, S., Boateng, A.A., 2017b. Pyrolysis and Bio Oil. *Agric. Nat. Resour.* 1–25.

Sagar, C.V., Kumari, N.A., 2013. Sustainable Biofuel Production From Water Hyacinth (*Eicchorhia Crassipes*). *Int. J. Eng. Trend Technol.* 4, 4454–4458.

Salamah, S., Jamilatun, S., 2017. The Utilization of Food Grade Liquid Smoke Purified by Activated Charcoal as Tilapia Fish Preservative. *Eksergi* 14, 29–34.

Salim, R., Rahmi, N., 2018. The Effect of Liquid Smoke Galam (*Malaleuca leucadendra*) in Biodegradable Film Form as Fish Cork Preservation. *J. Ris. Ind. Has. Hutan* 2, 75–90.

Salim, R., Rahmi, N., 2017. Pengaruh Asap Cair Kayu Galam (*Malaleuca leucadendra*) dalam Bentuk Biodegradable Film terhadap Pengawetan Ikan Gabus. *J. Ris. Ind. Has. Hutan* 9, 75–90.

<https://doi.org/10.24111/jrihh.v9i2.3391>

- Salima, R., Rahmia, N., 2017. Pengaruh Asap Cair Kayu Galam (*Malaleuca leucadendra*) dalam Bentuk Biodegradable Film terhadap Pengawetan Ikan Gabus. *J. Ris. Ind. Has. Hutan* 9, 75–90.
- Saloko, S., Darmadji, P., Setiaji, B., Pranoto, Y., 2014. Antioxidative and antimicrobial activities of liquid smoke nanocapsules using chitosan and maltodextrin and its application on tuna fish preservation. *Food Biosci.* 7, 71–79. <https://doi.org/10.1016/j.fbio.2014.05.008>
- Santos, J., Ouadi, M., Jahangiri, H., Hornung, A., 2020. Valorisation of lignocellulosic biomass investigating different pyrolysis temperatures. *J. Energy Inst.* xxx, 1–10. <https://doi.org/10.1016/j.joei.2020.04.011>
- Saputra, A., Bahri, S., Amri, A., 2015. Pirolisis Kayu Akasia menjadi Bio-Oil Menggunakan Katalis NiMo/NZA dengan Variasi Jumlah Pengembunan Logam dan Rasio Berat Katalis terhadap Biomassa. *Jom F. Tek.* 2, 1–6.
- Sari, A.T., Boedisantoso, R., 2017. Life Cycle Assessment (LCA) Emisi pada Proses Produksi Bahan Bakar Minyak (BBM) Jenis Solar dengan Pendekatan Metode Analytical Hierarchy Process (AHP). Surabaya.
- Sari, D.P., Hartini, S., Rinawati, D.I., Wicaksono, T.S., 2012a. Pengukuran Tingkat Eko-efisiensi Menggunakan Life Cycle Assessment untuk Menciptakan Sustainable Production di Industri Kecil Menengah Batik. *J. Tek. Ind.* 14, 137–144.
- Sari, D.P., Hartini, S., Rinawati, D.I., Wicaksono, T.S., Dkk, 2012b. Pengukuran Tingkat Eko-efisiensi Menggunakan Life Cycle Assessment untuk Menciptakan Sustainable Production di Industri Kecil Menengah Batik. *J. Tek. Ind.* 14, 137–144.
- Sarto, S., Hildayati, R., Syaichurrozi, I., 2019. Effect of Chemical Pretreatment using Sulfuric Acid on Biogas Production from Water Hyacinth and Kinetics. *Renew. Energy* 132, 335–350. <https://doi.org/10.1016/j.renene.2018.07.121>

- Septiyana, G.A., Ratnani, R.D., Riwayat, I., 2021. Prarancangan Pabrik Asap Cair Berbahan Baku Cangkang Kelapa Sawit Kapasitas Produksi 19.140 Ton/Tahun. Semarang.
- Setiawati, E., 2014. The Effect of Redistilled Galam Wood Vinegar (*Melaleuca leucadendron* Linn) to Fish Preservation. *J. Ris. Ind. Has. Hutan* 6, 13–22.
- Shah, Renato, C., Ac, M., Ds, R., 2017. Separation of Phenol from Bio-oil Produced from Pyrolysis of Agricultural Wastes. *Mod. Chem. Appl.* 5, 1–8. <https://doi.org/10.4172/2329-6798.1000199>
- Singgih, M.L., Henyitasari, E., 2009. Pemilihan Alternatif Perbaikan Kinerja Lingkungan Sektor Industri Potensial Di Jawa Timur dengan Metode Economic Input-Output Life-Cycle Assessment (EIO-LCA) Dan Analytic Network Process (ANP), in: Menuju Penataan Ruang Perkotaan Yang Berkelanjutan, Berdaya Saing, Dan Berotonomi. pp. 103–113.
- Soedarto, S., Siswanto, H.P., 2008. Respon Kualitas Bandeng (*Chanos Chanos*) Asap Terhadap Lama Pengeringan. *Berk. Ilm. Perikan.* 3, 49–53.
- Soeprobowati, T.R., 2012a. Mitigasi Danau Eutrofik : Studi Kasus Danau Rawapening Tri, in: Prosiding Seminar Nasional Limnologi VI Tahun 2012. pp. 36–48.
- Soeprobowati, T.R., 2012b. Mitigasi Danau Eutrofik : Studi Kasus Danau Rawapening, in: Prosiding Seminar Nasional Limnologi VI Tahun 2012. pp. 36–48.
- Soeprobowati, T.R., Suedy, S.W.A., 2010. Status trofik danau rawapening dan solusi pengelolaannya. *J. Sains Mat.* 18, 158–169.
- Solhatun, S., Hasibuan, R., Harahap, H., Iriani, I., Fithra, H., 2017. Improving Production of Liquid Smoke from Candlenut Shell by Pyrolysis Process, in: Proceedings of MICoMS 2. pp. 143–149. <https://doi.org/10.1108/978-1-78756-793-1-00056>

- Soltan, M., Elsamadony, M., Mostafa, A., Awad, H., Tawfik, A., 2019. Harvesting zero waste from co-digested fruit and vegetable peels via integrated fermentation and pyrolysis processes. *Environ. Sci. Pollut. Res.* 26, 10429–10438.
- Stephanie, S., Roth, B., Skare, M., Hernar, M., Jessen, F., Løvdal, T., Nordeng, A., Lerfall, J., 2020. Effect of chilling technologies on water holding properties and other quality parameters throughout the whole value chain : From whole fish to cold- smoked filets of Atlantic salmon (*Salmo salar*). *Aquaculture* 526, 735381. <https://doi.org/10.1016/j.aquaculture.2020.735381>
- Suhadi, Wiranda, N.S., 2019. Kajian Indeks Bias Terhadap Air Keruh Menggunakan Metode Plan Paralel. *JUPITER J. Penelit. Fis. dan Ter.* 1, 7–14.
- Sukmawati, Hardianti, F., 2018. Analisis Total Plate Count (Tpc) Mikroba pada Ikan Asin Kakap Di Kota Sorong Papua Barat. *J. Biodjati* 3, 72–78.
- Sulaiman, B., Bambang, A.N., Purnaweni, H., Lutfi, M., Mohammed, E.M.A., 2019. Coastal Community Perception Of Mangroves In Suli. *J. Pendidik. IPA Indones.* 8, 561–569. <https://doi.org/10.15294/jpii.v8i4.21396>
- Sulastri, S., Henny, C., Handoko, U., 2016. Environmental Condition and Trophic Status of Lake Rawa Pening in Central Java. *Oseanologi dan Limnol. di Indones.* 1, 23–38.
- Sulhatun, S., Hasibuani, R., Harahap, H., 2019. Influence Temperatur of Pyrolysis Process on Production of Liquid Smoke from Candlenut Shell by Examining its Potensial Coumpound. *Int. J. Recent Technol. Eng.* 8, 285–290. <https://doi.org/10.35940/ijrte.C1064.1083S19>
- Sulistiyowati, Cahyono, B., Swastawati, F., 2013. Penentuan Total Senyawa Fenolat dan Aktivitas Antioksidan pada Asap Cair dari Ampas Tebu Dan Kulit Tebu (*Sacharum Officinarum*) serta Identifikasi Komponen Penyusunnya. *Chem Info* 1, 362–369.

- Sunarsih, Sri, Pratiwi, Y., Sunarto, Y., 2012. Pengaruh suhu, waktu dan kadar air pada pembuatan asap cair dari limbah padat pati aren, in: Prosiding Seminar Nasional Aplikasi Sains & Teknologi (SNAST). pp. 290–297.
- Sunarsih, S, Pratiwi, Y., Suratno, Y., dkk, 2012. Pengaruh Suhu, Waktu dan Kadar Air pada Pembuatan Asap Cair dari Limbah Padat Pati Aren, in: Prosiding Seminar Nasional Aplikasi Sains & Teknologi (SNAST). pp. 9–13.
- Surest, A.H., Reza, M.S., Priyayi, D., dkk, 2013. Pembuatan Asap Cair Dari Kayu Akasia Dan Uji Awal Kemampuannya Sebagai Bahan Bakar Cair. *J. Tek. Kim.* 19, 38–44.
- Susanto, E., Agustini, T.W., Swastawati, F., Surti, T., Fahmi, A.S., 2011. Pemanfaatan Bahan Alami untuk Memperpanjang Umur Simpan Ikan Kembung (*Rastrelliger neglectus*). *J. Perikan. (J. Fish. Sci.)* XIII XIII, 60–69.
- Suyitno, Arifin, Z., Hadi, S., Hidayat, Y., 2009. Bio Oil dari Pirolisis Lambat Sekam Padi Basah : Sifat Fisik dan Unsur Kimia. *Mekanika* 7, 27–32.
- Swastawati, F., 2008. Quality And Safety Of Smoked Catfish (*Aries Talassinus*) Using Paddy Chaff And Coconut Shell Liquid Smoke. *J. Coastel Dev.* 12, 47–55.
- Swastawati, F., Agustini, T.W., Armanto, Y., Nurcahya, D.E., dkk, 2007a. Liquid Smoke Performance of Lamtoro Wood and Corn Cob. *J. Coast. Dev.* 10, 189–196.
- Swastawati, F., Agustini, T.W., Darmanto, Y., Dewi, E.N., 2007b. Liquid Smoke Performance of Lamtoro Wood and Corn Cob. *J. Coast. Dev.* 10, 1410–5217.
- Swastawati, F., Susanto, E., Cahyono, B., Aji, W., 2012. Quality Characteristic and Lysine Available of Smoked Fish 2, 1–6.
<https://doi.org/10.1016/j.apcbee.2012.06.001>
- Tanaya, D.R., Rudiarto, I., 2014. Potensi Pengembangan Ekowisata Berbasis Masyarakat di Kawasan Rawa Pening, Kabupaten Semarang. *J. Tek. PWK* 3,

71–81.

- Tarawan, V.M., Mantilidewi, K.I., Dhini, I.M., Radhiyanti, P.T., Sutedja, E., 2017. Coconut Shell Liquid Smoke Promotes Burn Wound Healing. *J. Evid. Based. Complementary Altern. Med.* 22, 436–440. <https://doi.org/10.1177/2156587216674313>
- Tran, T.K., Kim, N., Leu, H.J., Pham, M.P., Luong, N.A., Vo, H.K., 2021. The production of hydrogen gas from modified water hyacinth (*Eichhornia Crassipes*) biomass through pyrolysis process. *Int. J. Hydrogen Energy* 46, 13976–13984.
- Triastuti, W.E., Budhi, P.A., Agustiani, E., Hidayat, R.A., Retnoningsih, R., Nisa, A.A., 2019. Characterization of Liquid Smoke Bamboo Waste with Pyrolysis Method, in: *International Conference on Engineering, Advance Science and Industrial Application (ICETESIA)*. pp. 114–117.
- Tripathi, M., Bhatnagar, A., Mubarak, N.M., Sahu, J.N., Ganesan, P., 2020. RSM optimization of microwave pyrolysis parameters to produce OPS char with high yield and large BET surface area. *Fuel J.* 277, 1–11. <https://doi.org/https://doi.org/10.1016/j.fuel.2020.118184>
- Tsekos, C., Anastasakis, K., Schoenmakers, P.L., Jong, W. De, 2020. PAH sampling and quantification from woody biomass fast pyrolysis in a pyroprobe reactor with a modified tar sampling system. *J. Anal. Appl. Pyrolysis* 147, 104802. <https://doi.org/10.1016/j.jaap.2020.104802>
- Utomo, B.S.B., Marasabessy, I., Syarif, R., 2009. Penggunaan Asap Cair Campuran Batang Singkong dan Tempurung Kelapa dalam Pengolahan Ikan Tongkol Asap. *J. Pasca Panen dan Bioteknol. Kelaut. dan Perikan.* 4, 151–160.
- Valø, T., Jakobsen, A.N., Lerfall, J., 2020. The use of Atomized Purified Condensed Smoke (PCS) in Cold-Smoke Processing of Atlantic Salmon - Effects on Quality and Microbiological Stability of a Lightly Salted Product. *Food Control* 112, 107155. <https://doi.org/10.1016/j.foodcont.2020.107155>

- Veiga, P.A. da S., Schultz, J., Matos, T.T. da S., Fornari, M.R., Costa, T.G., Meurer, L., Mangrich, A.S., 2020. Production of high-performance biochar using a simple and low-cost method: optimization of pyrolysis parameters and evaluation for water treatment. *J. Anal. Appl. Pyrolysis* 20, 1–35. <https://doi.org/10.1016/j.jaap.2020.104823>
- Veksha, A., Latiff, N.M., Chen, W., Ng, J.E., Lisak, G., 2020. Heteroatom doped carbon nanosheets from waste tires as electrode materials for electrocatalytic oxygen reduction reaction: Effect of synthesis techniques on properties and activity, *Carbon*. Elsevier Ltd. <https://doi.org/10.1016/j.carbon.2020.05.075>
- Venu, H., Venkataraman, D., Purushothaman, P., Vallapudi, D.R., 2019. Eichhornia Crassipes Biodiesel As a Renewable Green Fuel for Diesel Engine Applications : Performance, Combustion, and Emission Characteristics. *Environ. Sci. Pollut. Res.* 26, 18084–18097.
- Verma, R., Suthar, S., 2015. Utility of Duckweeds as Source of Biomass Energy : a Review. *Bioenerg.* 8, 1589–1597. <https://doi.org/10.1007/s12155-015-9639-5>
- Vigouroux, R.Z., 2001. Pyrolysis Of Biomass Rapid Pyrolysis at High Temperature and Slow Pyrolysis for Active Carbon Preparation Rapid Pyrolysis at High Temperature and Slow Pyrolysis for Active Carbon Preparation. Stockholm.
- Villamagna, A.M., Murphy, B.R., 2010. Ecological and socio-economic impacts of invasive water hyacinth (*Eichhornia crassipes*): a review. *Freshw. Biol.* 55, 282–298.
- Wagiman, F.X., Ardiansyah, A., Witjaksono, W., 2014. Activity of Coconut-Shell Liquid-Smoke as an Insecticide on the Rice Brown Planthopper (*Nilaparvata lugens*). *ARPN J. Agric. Biol. Sci.* 9, 293–296.
- Wahyono, Y., Hadiyanto, H., Budihardjo, M.A., 2020. Assessing the Environmental Performance of Palm Oil Biodiesel Production in Indonesia : A Life Cycle Assessment Approach. *energies* 13, 1–25.

- Wibowo, S., 2012. Characteristic of Smoke liquid from Nyamplung Shell. J. Penelit. Has. Hutan 30, 218–227.
- Widawati, L., Budiyanto, B., 2014. Produce Liquid Smoke of Oil Palm Fruit Bunches for Preservative Boiled Salted Kembung Fish (*Rastrelliger* sp.). J. Agroteknologi 8, 15–28.
- Widiastuti, I., Herpandi, Ridho, M., Arrahmi, N.Y., 2019. Characteristics of Cuttlefish (*Sepia Recurvirostra*) Smoke Treated with Various Concentrations of Liquid Smoke. JPHPI 22, 24–32.
- Widiya, Idral, Zultiniar, 2014. Pengaruh Suhu dan Waktu distilasi Terhadap Komposisi Kimia Asap Cair dari Kulit Durian. Jom F. Tek. 1, 1–8.
- Wijaya, M., Noor, E., Irawadi, T.T., Pari, G., 2008. Karakteristik Komponen Kimia Asap Cair dan Pemanfaatannya sebagai Biopestisida. Bionature 9, 34–40.
- Wijayanti, W., 2014. Pengidentifikasian Entalpi Bahan Bakar Padat (Char) Dan Cair (Tar) Hasil Proses Pirolisis Biomasa. J. Rotor 7, 8–13.
- Wijayanti, W., Tanoue, K., 2013. Char formation and gas products of woody biomass pyrolysis. Phys. Procedia 32, 145–152. <https://doi.org/10.1016/j.egypro.2013.05.019>
- Woesono, H.B., 2011. Studi Pembuatan Asap Cair Dari Cangkang Kelapa Sawit (*Elaeis guineensis* Jacq) dengan Cangkang Kelapa (*Cocos nucifera* Linn). Agroteknose V, 9–16.
- Wong, S.L., Mak, S., 2008. Investigative studies of refractive indices of liquids and a demonstration of refraction by the use of a laser pointer and a lazy Susan. Phys. Educ. 1, 198–202. <https://doi.org/10.1088/0031-9120/43/2/010>
- Wu, P., Zhang, X., Wang, J., Yang, J., Peng, X., Feng, L., Zu, B., Xie, Y., Li, M., 2021. Pyrolysis of Aquatic Fern and Macroalgae Biomass into Bio-oil: Comparison and Optimization of Operational Parameters using Response Surface Methodology. J. Energy Inst. J. 97, 194–202.

- Wulandari, D.A., Kurniani, D., Edhisono, S., Ardianto, F., Dahlan, D., 2019. The effect of small dams in Rawa Pening catchment area on sedimentation rate of Rawa Pening Lake, in: MATEC Web of Conferences. pp. 1–5.
- Yang, H., Yan, R., Chen, H., Lee, D.H., Zhen, C., 2007. Characteristics of hemicellulose , cellulose and lignin pyrolysis. Fuel 86, 1781–1788. <https://doi.org/10.1016/j.fuel.2006.12.013>
- Yanti, S.R., Bahri, S., Amri, A., 2015. Pirolisis Kayu Akasia (Acacia Mangium) menjadi Bio-oil Menggunakan Katalis Ni/NZA dengan Variasi Pengembangan Logam dan Rasio Katalis. Jom F. Tek. 2, 1–7.
- Yao, Z., Ma, X., Xiao, Z., 2020. The Effect of Two Pretreatment Levels on the Pyrolysis Characteristics of Water Hyacinth. Renew. Energy 151, 514–527. <https://doi.org/10.1016/j.renene.2019.11.046>
- Yokayama, S., Matsumura, Y., 2008. Buku Panduan Biomassa Asia ; Panduan untuk Produksi dan Pemanfaatan Biomassa, 1st ed. Kementerian Pertanian, Kehutanan dan Perikanan, Jakarta.
- Yonathan, A., Prasetya, A.R., Pramudono, B., 2012. Produksi Biogas dari Eceng Gondok (Eichornia Crassipes) : Kajian Konsistensi dan pH Terhadap Biogas Dihasilkan. J. Teknol. Kim. dan Ind. 1, 412–416.
- Yuningsih, R., Sampoerno, Puspita, F., 2015a. Uji Beberapa Dosis Asap Cair Berbahan Baku Tandan Kosong Kelapa Sawit terhadap Pertumbuhan Bibit Kakao (Theobroma cacao L). Jom Faperta 1, 1–9.
- Yuningsih, R., Samporno, S., Pupita, F., 2015b. Test Based Liquid Smoke Some Standart Dose Empty Fruit Bunch Plantgrowt Of Cocoa (Theobroma Cacao L.). Jom Faperta 1, 1–9.
- Yuniningsih, S., Anggraini, S.P.A., 2013. Characterization of Liquid Smoke from Coconut Shell to Be Applicated as Safe Food Preservatives for Human Health. J. Agric. Food Technol. 3, 1–5.

- Yunita, M., Hendrawan, Y., Yulianingsih, R., 2015. Analisis Kuantitatif Mikrobiologi Pada Makanan Penerbangan (Aerofood ACS) Garuda Indonesia Berdasarkan TPC (Total Plate Count) Dengan Metode Pour Plate. *J. Keteknikan Pertan. Trop. dan Biosist.* 3, 237–248.
- Yusnaini, Soeparno, Suryanto, E., Armunanto, R., 2012. Physical, Chemical and Sensory Properties of Kenari (*Canarium indicum* L.) Shell Liquid Smoke-Immersed-Beef on Different Level of Dilution. *J. Indones. Trop.Anim.Agric* 37, 27–33. <https://doi.org/DOI: 10.14710/jitaa.37.1.27-33>
- Zhang, B., Zhong, Z., Li, T., Xue, Z., Ruan, R., 2018. Bio-oil Production from Sequential Two-step Microwave-assisted Catalytic Fast Pyrolysis of Water Hyacinth using Ce-doped γ -Al₂O₃/ZrO₂ Composite Mesoporous Catalyst. *J. Anal. Appl. Pyrolysis* 132, 143–150. <https://doi.org/10.1016/j.jaap.2018.03.006>
- Zuraida, I., Sukarno, Budijanto, S., 2011a. Antibacterial activity of coconut shell liquid smoke (CS-LS) and its application on fish ball preservation. *Int. Food Res. J.* 410, 405–410.
- Zuraida, I., Sukarno, Budijanto, S., dkk, 2011b. Antibacterial activity of coconut shell liquid smoke (CS-LS) and its application on fish ball preservation. *Int. Food Res. J.* 18, 405–410.