

## DAFTAR PUSTAKA

- Abdullah, N. & Gerhauser. (2008). Bio-oil derived from empty fruit bunches. *Fuel*. 87(1): 2606–2613.
- Abdullah, N., Gerhauser & Sulaiman. (2010). Fast pyrolysis of empty fruit bunches. *Fuel*. 89 (1): 2166–2169.
- Aguado, J., Serrano, D.P., Escola, J.M. & Peral, A. (2009). Catalytic cracking of polyethylene overzeolite mordenite with enhanced textural properties. *J. Anal. Appl. Pyrolysis*. 85(2):352–358.
- Ahmadi, S., Reyhanitash, E., Yuan, Z., Rohani, S., & Xu, C. (Charles). (2017). Upgrading of fast pyrolysis oil via catalytic hydrodeoxygenation: Effects of type of solvents. *Renewable Energy*, 114, 376–382. <https://doi.org/10.1016/j.renene.2017.07.041>.
- Ansari, K. B., Arora, J. S., Chew, J. W., Dauenhauer, P. J., & Mushrif, S. H. (2019). Fast pyrolysis of cellulose, hemicellulose, and lignin: effect of operating temperature on bio-oil yield and composition and insights into the intrinsic pyrolysis chemistry. *Industrial & Engineering Chemistry Research*, 58(35): 15838-15852. [doi.org/10.1021/acs.iecr.9b00920](https://doi.org/10.1021/acs.iecr.9b00920).
- A'Yuni, Q., (2017). Desain Dan Karakteristik Permukaan Kobalt Oksida Pada Pendukung Katalis. *Journal of Research and Technology*.3(1): 28-37.
- Aziz, I., Nurbayti, D. & Hakim. (2012). Uji Karakterisasi Biodiesel yang dihasilkan dari Minyak Goreng Bekas menggunakan Katalis Zeolit Alam (H-Zeolit) dan KOH. *Jurnal Kimia Valensi*. 25(5).
- Baltazar, Alvaro, R., Rodrigo, E., Maykel, G., Gerardo, R. & Ramiro. (2015). Preparation and Characterization of Natural Zeolite Modified with Iron Nanoparticles. *Hindawi Publishing Corporation Journal of Nanomaterials*. Article ID 364763, 8 pages.
- Basak B., Eren Ptn & Ersan Ptn. (2007). Rapid Pyrolysis of Olive Residue. 1. Effect of Heat and Mass Transfer Limitations on Product Yields and Bio-oil Composition. *Energy Fuels*. 21 (3): 1768-1776.
- Batubara, L. P. (2002). Potensi Biologis Daun Kelapa Sawit sebagai Pakan Basal dalam Ransum Sapi Potong. *Prosiding Seminar Nasional Teknologi Peternakan*. Pusat Penelitian dan Pengembangan Peternakan. Badan Penelitian dan Pengembangan Pertanian. Jakarta:Departemen Pertanian.
- Beeckman, J.W. & Froment, G.F. (1979). Catalyst deactivation by active site coverage and poreblockage. *Ind. Eng. Chem. Fundam*. 18 (3):245–256.
- Bish, David, L. & William, J. (2018). *Thermal Behavior of Natural Zeolites*. Los Alamos National Laboratory Hydrology, Geochemistry, and Geology. MS D469 Los Alamos: New Mexico.

- Bulushev, D. Ross, J. (2011). Catalysis for conversion of biomass to fuels via pyrolysis and gasification: A review. *Catal. Today*. 171:1–13.
- Byun, M. Y., Park, D. W., & Lee, M. S. (2020). Effect of oxide supports on the activity of PD based catalysts for furfural hydrogenation. *Catalysts*, 10(8). <https://doi.org/10.3390/catal10080837>
- Cheng, S., Wei, L., Julson, J., & Rabnawaz, M. (2017). Upgrading pyrolysis bio-oil through hydrodeoxygenation (HDO) using non-sulfided Fe-Co/SiO<sub>2</sub> catalyst. *Energy Conversion and Management*, 150(June), 331–342. <https://doi.org/10.1016/j.enconman.2017.08.024>
- Choudhary, T. & Phillips, C. (2011). Renewable Fuels via Catalytic Hydrodeoxygenation. *Applied Catalysis A: General* .397 : 1-12.
- Dickerson, T. & Soria, J. (2012). Catalytic fast pyrolysis : a review, Energies Environmental Protection Agency. Regulation of Fuels and Fuel Additives. *Regulation of Fuels and Fuel Additives*. 6(13), 1320–1358.
- Dirgantara, H. & Rahmawati. (09 Jun/2021). *Permintaan bahan bakar melonjak, harga minyak WTI tembus US\$ 70 per barel*. Diakses pada 30 Oktober 2021, dari <https://investasi.kontan.co.id/news/permintaan-bahan-bakar-melonjak-harga-minyak-wti-tembus-us-70-per-barel>.
- Fardhyanti, S., Damayanti, A. dan Larasati, A. (2017). Karakterisasi Bio-Oil dari Hasil Pirolisis terhadap Biomasa. *Seminar Nasional Teknik Kimia Kejuangan*. p. 5.
- Fauzi, Y, Widyastuti Y. E, Wibawa I. S, Paeru R. H. (2012). *Kelapa Sawit*. Jakarta : Penebar Swadaya.
- Fekhar, B., Zsinka, V., & Miskolczi, N. (2020). Thermo-catalytic co-pyrolysis of waste plastic and paper in batch and tubular reactors for in-situ product improvement. *Journal of Environmental management*, 269: 1-9. <https://doi.org/10.1016/j.jenvman.2020.110741>.
- Flanigen, M., Robert, W., Broach. & Stephen, T. (2010). *Zeolites in Industrial Separation and Catalysis*. ISBN: 978-3-527-32505-4.
- Fuoco D. (2012). A New Method for Characterization of Natural Zeolites and Organic Nanostructure Using Atomic Force Microscopy. *Italian National Board of Chemists and Italian Chemical Society*. 2:79-91. doi:10.3390/nano2010079.
- Furimsky, E. (2000). Catalytic hydrodeoxygenation. *J. Applied Catal.* 199:147-90.
- Gasser, R.P.H. (1985). *An Introduction to Chemisorption and Catalysis by Metal*. Oxford: Clarendon Press.
- Gea, S., Irvan, I., Wijaya, K., Nadia, A., Pulungan, A.,N., Sihombing, J.,L. & Rahayu. (2022). A Comprehensif Review Of Experimental Parameters In Bio Oil Upgrading From Pyrolysis Of Biomass To Buiofuel Through Catalytic Hidrodeoxigenation. *Bioenergy research*. <https://doi.org/10.1007/s12155-022-10438-w>

- Georgiev, D., Bogdanov, Angelova, Markovska & Hristov. (2009). Synthetic Zeolites-Structure, Classification, Current Trends in Zeolite Synthesis : *Review. International Science Conference*.
- Gilkey, M. J., Panagiotopoulou, P., Mironenko, A. V., Jenness, G. R., Vlachos, D. G., & Xu, B. (2015). Mechanistic Insights into Metal Lewis Acid-Mediated Catalytic Transfer Hydrogenation of Furfural to 2-Methylfuran. *ACS Catalysis*, 5(7), 3988–3994. <https://doi.org/10.1021/acscatal.5b00586>
- Grioui, N., Halouani, K., & Agblevor, F. A. (2014). Bio-oil from pyrolysis of Tunisian almond shell: Comparative study and investigation of aging effect during long storage. *Energy for Sustainable Development*, 21(1), 100–112. <https://doi.org/10.1016/j.esd.2014.05.006>
- He, X., & Liu, H. (2014). Efficient synthesis of 1,1-diethoxyethane via sequential ethanol reactions on silica-supported copper and H-Y zeolite catalysts. *Catalysis Today*, 233, 133–139. <https://doi.org/10.1016/j.cattod.2014.01.023>
- Hambali, E., Mujdalipah, A., Tambunan, A. H. & Pattiwiri, A.W. (2007). *Teknologi Bioenergi*. Jakarta: Agromedia Pustaka
- Harsojuwono & Arnata.(2015). *Teknologi Polimer. Industri Pertanian*. Denpasar: Intimedia.
- Haryana, A. (2010). *Biomass Utilization as Renewable Energy for Optimization of National Energy Mix*. Jakarta: BAPPENAS Working Papers.
- Hassan, O. A. & Ishida, M. (1992). Status of utilization of selected fibrous crop residues and animal performance with special emphasis on processing of oil palm frond (OPF) for ruminant feed in Malaysia. *Trop. Agric. Res. Series*. 24:135-143.
- Hidayat, Hidayat. Nurcahyo, IF. Sofiana, A. & Saputro, A. Reaksi HDO THF Menggunakan Katalis Pt/y-Al<sub>2</sub>O<sub>3</sub> yang Diperkaya Alumina : Pengaruh Temperatur terhadap Distribusi Produk, Laju Reaksi dan Deaktivasi Katalis. *Jurnal Penelitian Kimia*. 10(1):94-104.
- Hu, X., & Gholizadeh, M. (2019b). Biomass pyrolysis: A review of the process development and challenges from initial researches up to the commercialisation stage. *Journal of Energy Chemistry*, 39: 109-143. <https://doi.org/10.1016/j.jechem.2019.01.024>.
- Hu, Y., Wang, H., Lakshmikandan, M., Wang, S., Wang, Q., He, Z., & Abomohra, A.E.F.(2020c). Catalytic co-pyrolysis of seaweeds and cellulose using mixed ZSM-5 and MCM-41 for enhanced crude bio-oil production. *Journal of Thermal Analysis and Calorimetry*, 143: 827–842. <https://doi.org/10.1007/s10973-020-09291-w>.
- Jaatinen, S. K., Karinen, R. S., & Lehtonen, J. S. (2017). Liquid Phase Furfural Hydrotreatment to 2-Methylfuran with Carbon Supported Copper, Nickel, and Iron Catalysts. *ChemistrySelect*, 2(1), 51–60. <https://doi.org/10.1002/slct.201601947>

- Juhantoro, N., Ariana, I. & Sanuri, S. (2012). Properties Bahan Bakar Batubara Cair untuk Bahan Bakar Marine Diesel Engine. *Jurnal Teknik ITS*.1(1): G271-G275.
- Kalapathy, U., A. Proctor & Shultz. (2000). A Simple Method for Production of Pure Silica from Rice Hull Ash. *Bioresource Technology*. 73: 257-262.
- Kim, W., Koo, B., Ryu, J., Lee, J., Kim, Lee, Kim & Choi, S. (2013). Bio-oil from the pyrolysis of palm and Jatropha wastes in a fluidized bed. *Fuel Process. Technol.* 108(1): 18–124.
- Lawal, A. (2012). Hydrodeoxygenation of acetic acid in a microreactor. *Chem Eng Sci.* 84:761–771. [https:// doi. org/ 10.1016/j. ces. 2012. 09. 018](https://doi.org/10.1016/j.ces.2012.09.018)
- Lanzac, T, Palos, R& Hita. (2018), Revealing the pathways of catalyst deactivation by coke during the hydrodeoxygenation of raw bio-oil. *Appl Catal B Environ.* 239:513–524. [https:// doi. org/ 10. 1016/j. apcatb. 2018](https://doi.org/10.1016/j.apcatb.2018)
- Leach, B.E. (1983). *Applied Industrial Catalysis. Volume 2*. New York : Academic press.
- Lee, H. W., Jeong, H., Ju, Y. M., & Lee, S. M. (2020). Upgrading of bio-oil by ex-situ catalytic pyrolysis and in-line esterification in fluidized bed reactor. *Korean Journal of Chemical Engineering*, 37(7), 1174–1180. <https://doi.org/10.1007/s11814-020-0527-0>
- Levenspiel, O. (1999). *Chemical Reaction Engineering, 2nd ed.* New York: John. Wiley and Sons Inc.
- Lian, X., Xue, Y., Zhao, Z., Xu, G., Han, S.,& Yu, H. (2017). Progress on upgrading methods of bio-oil: A review. *International Journal Of Energy Research*, 41 (13): 1798-1816. <https://doi.org/10.1002/er.3726> .
- Li, Z., Yang, C., Wu, S. and Kan, Q. (2017). Nano-Co<sub>3</sub>O<sub>4</sub> supported on magnetic N-doped graphene as highly efficient catalyst for epoxidation of alkenes. *Molecular Catalysis*. 432: 267-273.
- Lu, S., Li, K., Huang, F., Chen, C. and Sun, B. (2017). Efficient MnO<sub>x</sub>-Co<sub>3</sub>O<sub>4</sub>-CeO<sub>2</sub> catalysts for formaldehyde elimination. *Applied Surface Science*. 400: 277-282.
- Lucarelli, C., Bonincontro, D., Zhang, Y., Grazia, L., Carrasco, M.R., Thieuleux, C., Quadrelli, E.A., Dimitratos, N., Cavani, F., Albonetti, S. (2019). Tandem hydrogenation/ hydrogenolysis of furfural to 2-methylfuran over a Fe/Mg/O catalyst: Structure–activity relationship. *Catalysts*, 9: 1-16. <https://doi.org/10.3390/catal9110895>.
- Mansyur, A. (1980). *Budidaya Tanaman Panili dan Kelapa Sawit*. Institut Pertanian Bogor: Bogor.
- Margeta, K., Logar, N., Siljeg, M. & Farkas. (2013). *Licensee InTech. Natural Zeolites in Water Treatment – How Effective is Their Use*.
- Maulina, S. (2018). Pirolisis Pelepah Kelapa Sawit Untuk Menghasilkan Fenol Pada Asap Cair. *Jurnal Teknik Kimia USU*. 7(2):12–16.

- Mei, J., Zhao, S., Xu, H., Qu, Z. and Yan, N. (2016). The performance and mechanism for the catalytic oxidation of dibromomethane ( $\text{CH}_2\text{Br}_2$ ) over  $\text{Co}_3\text{O}_4/\text{TiO}_2$  catalysts. *RSC Advances*. 6: 31181-31190.
- Mercader, F. (2010). Pyrolysis Oil Upgrading by High Pressure Thermal Treatment. *Fuel*. 89:2829-2837.
- Mierczynski, P., Maniecki, P., Kaluzna-Czaplinska, J., Szykowska, M.I., Maniukiewicz, W., Lason-Rydel, M. & Jozwiak, W. (2013). Hydroconversion of parafine LTP56-H over nickel/ Na-mordenite catalysts, *Cent. Eur. J. Chem.* 11(2):304–312.
- Miguel, MF., Groeneveld, MJ.& Kersten. (2011). Hydrodeoxygenation of pyrolysis oil fractions: process understanding and quality assessment through co-processing in refinery units. *Energy Environ Sci.* 4:985–997. [https:// doi.org/ 10. 1039/ c0ee00523a](https://doi.org/10.1039/c0ee00523a). 07. 073
- Mohammad, M., Kandaramath Hari, T., Yaakob, Z., Chandra Sharma, Y., & Sopian, K. (2013). Overview on the production of paraffin based-biofuels via catalytic hydrodeoxygenation. *Renewable and Sustainable Energy Reviews*. 22(10): 121–132.
- Moravvej, Z., Farshchi Tabrizi, F., & Rahimpour, M. R. (2021). Vapor Phase Conversion of Furfural to Valuable Biofuel and Chemicals Over Alumina-Supported Catalysts: Screening Catalysts. *Topics in Catalysis*, 2. <https://doi.org/10.1007/s11244-021-01470-9>
- Moshoeshe, M., Misael, T. & Veronica. (2017). A Review of the Chemistry, Structure, Properties and Applications of Zeolites. *American Journal of Materials Science*, 7(5): 196-221.
- Mundriyastutik, Y., Anggoro, D. & Hidayati, N. (2016). Preparasi dan Karakteristik Katalis CoMo/Zeolit Y dengan Metode Pertukaran Ion Indonesia. *Jurnal Farmasi*. 1(1): 28-32.
- Norman J. (2001). Nontechnical Guide to Petroleum Geology, Exploration, Drilling, and Production. *PennWell*: 1-4, ISBN 0-87814-823-X.
- Nugrahaningtyas, Trisunaryanti, W., Triyono, Nuryono, Widjonarko, D., Yusnani, A. dan Mulyani.(2009). Preparation And Characterization The Non-Sulfided Metal Catalyst: Ni/Usy And Nimo/Usy. *Indo. J. Chem.* 9(2): 177 – 183.
- Onoja, E., Chandren, S., Razak, F., Mahat, N& Wahab, R. (2018). Oil Palm (*Elaeis guineensis*) biomass in Malaysia: The present and future prospects, Waste Biomass Valorization.
- Ordenez, S. & Eva, D. (2009). *Basic Zeolites: Structure, Preparation and Environmental Applications*. Department of Chemical Engineering and Environmental Technology, Faculty of Chemistry, University of Oviedo: Spain. ISBN 978-1-60741-046-1.
- Pari, G., Sofyan, K., Syafii, W., Buchari & Yamamoto,H. (2006). Kajian Struktur Arang dari Lignin. *Jurnal Penelitian Hasil Hutan*. 24(1): 9-20.

- Perwira, G. (2014). Analisis Luas Permukaan Arang Aktif Dengan Menggunakan Metode BET (SAA).
- Petranovskii, V., Chaves-Rivas, Espinoza, M., Pestryakov & Kolobova. (2016). Potential uses of natural zeolites for the development of new materials: short review. *MATEC Web of Conferences* 85, 01014. Universidad Nacional Autonoma de Mexico, Ensenada, 22800: Mexico.
- Pirmoradi, M., & Kastner, J.R. (2021). A kinetic model of multi-step furfural hydrogenation over a Pd-TiO<sub>2</sub> supported activated carbon catalyst. *Chemical Engineering Journal*, 414: 1-11. <https://doi.org/10.1016/j.cej.2021.128693>
- Pourzolfaghar, H., Abnisa, F., Daud, W.M.A.W., Aroua, M.K., & Mahlia, T.M.I. (2020). Catalyst Characteristics and Performance of Silica-Supported Zinc for Hydrodeoxygenation of Phenol. *Energies*, 13 (2802) : 1-13. <https://doi.org/10.3390/en13112802>
- Prasetyani, M. & Ermina M. (2009). *Tulisan Analisis Ekonom Suatu Bank di Jakarta: Potensi dan Prospek Bisnis Kelapa Sawit di Indonesia*. Jakarta.
- Purnama, E.F., Nikmatin, S.& Langenati, R. (2006). Pengaruh Suhu Reaksi Terhadap Derajat Kristalinitas Dan Komposisi Hidroksiapatit Dibuat Dengan Media Air Dan Cairan Tubuh Buatan (Synthetic Body Fluid). *Indonesian Journal of Materials Science*:154 – 162.
- Pulungan, A. N., Kembaren, A., Nurfajriani, N., Syuhada, F. A., Sihombing, J. L., Yusuf, M., & Rahayu, R. (2021). Biodiesel production from rubber seed oil using natural zeolite supported metal oxide catalysts. *Polish Journal of Environmental Studies*, 30(6), 5681–5689. <https://doi.org/10.15244/pjoes/135615>
- Purwanto, W., Supramono, Muthia R. & Annisa. (2012). Konversi Limbah Kelapa Sawit Menjadi Bio-oil melalui Proses Catalytic Fast Pyrolysis dan Upgrading-nya. *Aptekindo*: 285-293.
- Rahman, A., Abdullah & Sulaiman, F. (2014). Temperature Effect on the Characterization of Pyrolysis Products from Oil Palm Fronds. 2: 14–21.
- Ribeiro, M.F., Ribeiro, F.R., Dufresne, P. & Marcilly, C. (1987). Influence of Si/Al ratio on the catalytic properties of NiH Mordenite in the disproportionation of toluene. *J. Mol. Catal.* 39(2):269–276.
- Richardson, J.T. (1989). *Principles of Catalyst Development*. New York : Plenum Press.
- Ridhuan, K., Irawan, D. & Inthifawzi. (2019). Proses Pembakaran Pirolisis dengan Jenis Biomassa dan Karakteristik Asap Cair yang Dihasilkan. *Jurnal Program Studi Teknik Mesin UM Metro*.8(1): 69-78.
- Rouquerol, F., Rouquerol, J., & Sing, K. (1999). *Adsorption by Powders and Porous Solids. Principles Methodology and Application*. London: Academic Press, Inc.
- Rusli1, N., Ghani, A., Mat, K. Yusof, M., Saad & Hassim, A. (2021). The Potential of Pretreated Oil Palm Frond in Enhancing Rumen Degradability

- and Growth Performance: A Review. *Advances in Animal and Veterinary Sciences*. 9(6): 811-822.
- Rusnadi, I., Amin, J. M., Zikri, A., Sabatini, R. & Sriwijaya, P. N. (2021). Penggunaan katalis NiMo/Al<sub>2</sub>O<sub>3</sub> Pada Proses Hydrotreating Minyak Jelantah Menjadi Green Diesel. *Jurusan Teknik Kimia program Studi Sarjana Terapan teknik Energi*. 1(12): 465-474.
- Salman, H., Shaheen, H., Abbas G. & Khalouf. (2017). Use of Syrian natural zeolite for heavy metals removal from industrial waste water: Factors and mechanism. *Journal of Entomology and Zoology Studies*. 5(4): 452-461.
- Samosir, A., Bahri, S. & Aman. (2014). Pirolisis Limbah Pelepah Sawit Menjadi Bio Oil Menggunakan Ni.Mo/Lempung Cengar. *Jom FTEKNIK*. 1(2): 1-9.
- Sastrosayono, S. (2003). *Budidaya Kelapa Sawit*. Purwokerto. Agromedia Pustaka.
- Satterfield, C. (1991). *Heterogeneous Catalysis in Industrial Practice*. New York: McGraw-Hill.
- Satterfield, C.N. (1980). *Heterogenous Catalyst in Practice*. New York: McGraw Hill Book Company.
- Schweitzer, P. A. (2014). *Handbook of Separation Techniques for Chemical Engineers*. McGraw-Hill Book Company.
- Seader, D., Ernest, J., Henley, D. & Roper. (2011). *Separation Process Principles: Chemical and Biochemical Operation*. Westford : John Wiley & Sons, Inc.
- Setiaji, H. (11 Okt/2021). Krisis Energi Kian Menjadi-jadi, Harga Minyak Naik Lagi. Diakses pada 30 Oktober 2021, dari <https://www.cnbcindonesia.com/market/20211011075831-17-282846/krisis-energi-kian-menjadi-jadi-harga-minyak-naik-lagi>.
- Sihombing, J. L., Gea, S., Pulungan, A. N., Agusnar, H., Wirjosentono, B., & Hutapea, Y. A. (2018). The characterization of Sarulla natural zeolite crystal and its morphological structure. *AIP Conference Proceedings*, 2049(December). <https://doi.org/10.1063/1.5082467>.
- Solomons, T. W. G. & Fryhle C. (2011). *Organic Chemistry* (10th ed.). WILEY.
- Sui, C., Zhang, T., Dong, Y., Yuan, F., Niu, X. and Zhu, Y. (2017). Interaction between Ru and Co<sub>3</sub>O<sub>4</sub> for promoted catalytic decomposition of N<sub>2</sub>O over the Ru-Co<sub>3</sub>O<sub>4</sub> catalysts. *Molecular Catalysis*. 435: 174-181.
- Surbakti, T., Tafsir, M. & Daulay, A. (2014). Kecernaan bahan kering dan bahan organik ransum yang mengandung pelepah daun kelapa sawit dengan perlakuan fisik, kimia, biologi dan kombinasinya pada domba. *Jurnal peternakan integratif*. 3(1): 62-70.
- Susanti, M. & Wijaya, E. (2019). Pemanfaatan Pelepah Kelapa Sawit Sebagai Usaha Kreatif dalam Menunjang Perekonomian Masyarakat Desa Nakau - Bengkulu Tengah. *Jurnal Manajemen dan Kewirausahaan*. 10(3): 30-38.

- Terry, L., Li, C., Chew, J., Aqsha, A., How, B., Loy, A., Chin, B., Khaerudini, D., Hameed, Guan, G & Sunarso, J. (2021). Bio-Oil Production From Pyrolysis Of Oil Palm Biomass And The Upgrading Technologies: A Review. *Carbon Resources Conversion*. 4:239–250.
- Thacker, H. (2013). *How a strong regulatory push can jumpstart Indonesia's biomass sector*. Indonesia: Frost and Sullivan.
- Thommes, M., Kaneko, K., Neimark, A. V., Olivier, J. P., Rodriguez-Reinoso, F., Rouquerol, J. & Sing, K. S. W. (2015). Physisorption of Gases, with Special Reference to the Evaluation of Surface Area and Pore Size Distribution (IUPAC Technical Report). *Pure Appl. Chem.*, 87 (9–10): 1051–1069. <https://doi.org/10.1515/pac-2014-1117>.
- Topsoe, H., Clausen, Bjerne., S., Massoth & Franklin, E. (1996). *Hydrotreating Catalysis Science and Technology*. Berlin: Springer.
- Trisunaryanti, W., Purwono, S., & Putranto, A. (2008). Catalytic hydrocracking of waste lubricant oil into liquid fuel fraction using ZnO, Nb<sub>2</sub>O<sub>5</sub>, activated natural zeolite and their modification. *Indones. J. Chem.* 8 (3):342–347.
- Trisunaryanti, W., Triyono, Wijaya, K., Majid, A.B., Priastomo, Y., Febriyanti, E., Syafitri, Hasyati & Nugroho, A. (2012). Characterization and Activity Test of Mordeinite and Y-zeolite Catalysts in Hydrocracking of Tire Waste to Fuel Fractions. *Prosiding Seminar Nasional Kimia Unesa*, C102–C113.
- Tsitsishvili, V., Nanuli, D., Spartak, U., Maia, A., Mirdzveli & Nijaradze. (2017). Ion Exchange Properties Of Georgian Natural Zeolites. *General Industrial and Ecological Chemistry*. 12(1):95-101.
- Tugsuu, T., Yoshikazu, S. & Enkhsaruul. (2017). Preparation of the Natural Zeolite Based Catalyst for Hydrocracking Process of Petroleum Derived Atmospheric Residue. *Journal of Materials Science and Chemical Engineering*. 5: 14-22.
- Usui, K., Kidena, K., Murata, S., Nomura, M., & Trisunaryanti, W. (2004). Catalytic hydrocracking of petroleum-derived asphaltene by transition metal-loaded zeolite catalysts. *J. Fuel*. 83 (14):1899–1906.
- Wang, W., Yang, Y., Luo, H. & Liu W. (2010). Characterization and hydrodeoxygenation properties of Co promoted Ni-Mo-B amorphous catalysts: Influence of Co content. *React. Kinet. Mech. Catal.* 101: 105–115.
- Wang, J., Luo, Z., Zhang, J., Dang, Q., & Chen, W. (2011). Reactions of furfural and acetic acid as model compounds for bio-oil upgrading in supercritical ethanol. *2011 International Conference on Electronics, Communications and Control, ICECC 2011 - Proceedings*, 2, 1587–1592. <https://doi.org/10.1109/ICECC.2011.6067982>
- Wang, Y., He, T., Liu, K., Wu, J. & Fang. (2012). From biomass to advanced bio-fuel by catalytic pyrolysis/hydro-processing: Hydrodeoxygenation of bio-oil derived from biomass catalytic pyrolysis. *Bioresour. Technol.* 108: 280–284.



- Webster, E., Drago, S & Zerner, M. (1999). A Method for Characterizing Effective Pore Sizes of Catalysts. *J. Am. Chem. B.* 103(8):1242–1249.
- Weitkamp, J. & Puppe. (1999). *Catalysis and Zeolites: Fundamentals and Applications*. Berlin: Springer-Verlag Berlin Heidelberg.
- Widiastuti & Panji, T. (2007). Pemanfaatan Tandan Kosong Kelapa Sawit Sisa Jamur Merang (*Volvaria volvacea*) (TKSJ) sebagai Pupuk Organik pada Pembibitan Kelapa Sawit. *Menara Perkebunan*, 7(2): 70-79.
- Xiu, S. & Shahbazi, A., (2012). Bio-oil production and upgrading research: A review. *Renewable and Sustainable Energy Reviews*. 16:4406–4414.
- Zakaria, A. K. M., Asgar, M. A., Eriksson, S. G., Ahmed, F. U., Yunus, S. M., Azad, A. K. & Rundlöf, H. (2003). Preparation of Zn substituted Ni-Fe-Cr ferrites and study of the crystal structure by neutron diffraction. *Materials Letters*, 57.
- Zeng, Y., Himmel, E. & Ding, S. (2017). Visualizing chemical functionality in plant cell walls. *Biotechnol. Biofuels*. 10(1): 1-16.
- Zheng, Y., Wang, J., Li, D., Liu, C., Lu, Y., Lin, X., & Zheng, Z. (2021). Activity and selectivity of Ni-Cu bimetallic zeolites catalysts on biomass conversion for bio-aromatic and bio-phenols. *Journal of the Energy Institute*, 97: 58-72. <https://doi.org/10.1016/j.joei.2021.04.008>