



DAFTAR PUSTAKA

- Abdullah, I., Wibowo, W., Kosela, S., and Krisnandi, Y.K., 2020, The Use of Silica Extracted from Kaolin as Catalyst Support for Esterification of 4-Hydroxybenzoic Acid with Sucrose, *J. Kim. Sains Apl.*, 23, 196-202.
- Aboul-Gheit, A.K., Gad, F.K., Abdel-Aleem, G.M., El-Desouki, D.S., Abdel-Hamid, S.M., Ghoneim, S.A., and Ibrahim, A.H., 2014, Pt, Re and Incorporation in Sulfated Zirconia as Catalyst for n-pentane Isomerization, *Egypt. J. Pet.*, 23, 303-314.
- Adeeva, V., Dehaan, J.W., Janchen, J., Lei, G.D., Schunemann, V., Vandeven, L.J.M., Sachlterm W.M.H. and VAnsanten, R.A., 1995, Acid Sites in Sulfated and Metal-Promoted Zirconium Dioide Catalysts, *J. Catal.*, 151(2), 364-372.
- Ahmed, A.I., El-Hakam, S.A., Samra, S.E., El-Khouly, A.A., and Khder, A.S., 2008, Structural Characterization of Sulfated Zirconia and Their Catalytic Activity in Dehydration of Ethanol, *Colloids Surf, A Physicochem Eng Asp.*, 317, 62-70.
- Al-faze, R., Kozhevnikova, E.F., and Kozhevnikov, I.V., 2021, Diethyl Ether Conversion to Ethane and Ethanol Catalyzed by Heteropoly Acids, *ACS Omega*, 6, 9310-9318.
- Aneu, Wijaya, K., and Syoufian, A., 2021, Silica-Based Solid Acid Catalyst with Different Concentration of H₂SO₄ and Calcination Temperatur: Preparartion and Characterization, *Silicon*, 13, 2265-2270.
- Arico, A.S., Baglio, V., Blasi, A.D., and Antonucci, V., 2003, FTIR Spectroscopic Investigation of Inorganic Fillers for Composite DMFC Membranes, *Electrochem. Commun.*, 5, 862-866.
- Bagherim S., Muhd Julkapli, N., and Bee Abd Hamid, S., 2014, Titanium Dioxide as a Catalyst Support in Heterogeneous Catalysis, *Sci. World J.*, 2014, 1-22.
- Bamoniri, A., Mirjalili, B.F., Nazemian, S., and Mahabadi, N.Y., 2014, Nano silica phosphoric acid as an efficient catalyst for one-pot synthesis of 2,4,5-tri-substituted imidazoles under solvent free condition, *Bulg. Chem. Comm.*, 46(1), 79-84.
- Banerjee, R., Chenna, S., and Crozier, P., 2009, Nanocharacterization and Control of Supported Ni Nanocatalyst for Partial Oxidation of Methane, *Microsc. Microanal.*, 15, 732-733.
- Basu S., and Sen, A.K., 2021, Dehydration of glycerol with silica-phosphate-supported copper catalyst, *Res. Chem. Intermed.*, 46, 3545-3568.
- Bergna, H.E., and Roberts, W.O., 2006, *Colloidal Silica: Fundamentals and Applications*, Washington DC: American Chemical Society.
- Biswas, R.K., Khan, P., Mukherjee, S., Mukhopadhyay, A.K., Ghosh, J., and Muraleedharan, K., 2018, Study of short range structure of amorphous Silica



from PDF using Ag radiation in laboratory XRD system, RAMAN and NEXAFS, *J. Non Cryst. Solids*, 488, 1-9.

- Bockisch, C., Lorance, E.D., Hartnett, H.E., Shock, E.L., and Goul, I.R., 2018, Kinetics and Mechanisms of Dehydration of Secondary Alcohols under Hydrothermal Conditions, *ACS Earth Space Chem.*, 2, 821-832.
- Borsa, T., Pacas, D. A., Selim, S. and Cowley, S.W., 1998, Properties of an Ethanol-Diethyl Ether Water Fuel Mixture for Cold-Start Assistance of an Ethanol-Fueled Vehicle, *Ind. Eng. Chem. Res.*, 37, 3366-3374.
- Campelo, J.M., Conesta, T.D., Gracia, M.J., Luque, R., Marinas, J.M., and Romero, A.A., Microwave facile preparation on highly active and dispersed SBA-12 supported metal nanoparticles, *Green Chem.*, 2008, 10, 853-858.
- Chaichana, E., Boonsinvarothai, N., Chitpong, N., and Jongsomjit, B., 2018, Catalytic Dehydration of Ethanol and Diethyl Ether Over Alumina Catalyst Containing Different Phases with Boron Modification, *J. Porous Mater.*, 26, 599-610.
- Christiansen, M.A., Mphourmpakis, G., and Vlachos, D.G., 2013, Density Functional Theory-Computed Mechanism of Ethylene and Diethyl Ether Formation from Ethanol on γ -Al₂O₃, *ACS Catal.*, 3, 1965-1975.
- Colleoni, C., Esposito, S., Grasso, R., Gulino, M., Musumeci, F., Romelli, D., Rosace, G., Salesi, G., and Scordino, A., 2014, Delayed Luminescence Induced by Complex Domains in Water and in Aqueous Solution, *Phys. Chem. Chem. Phys.*, 18, 81-92.
- Costa, D., Andrade, R., and Barbosa, F., 2012, Renewable Energy and Biofuels: Biodiesel and Bioethanol As an Opportunity of Investment Energia Renovavel E Os Biocombustiveis, *Biodiesel Energy*, 15-32.
- De Boer, J.H., Fahim, R.B., BGLinsen, Vissere, W.J., and deVlesschaumer, W.F.N.M., 1967, Kinetics of Dehydration of Alcohol on Alumina, *J. Catal.*, 7, 163 – 172.
- Dixit, C.K., Bhakta, S., Kumar, A., Suib, S.L., and Rusling, J.F., 2016, Fast Nucleation for Silica Nanoparticle Synthesis Using a Sol-Gel Method, *Nanoscale*, 8, 19662-19667.
- Efiyanti, L. dan Santi, D., 2016, Pengaruh Katalis NiO dan NiOMoO Terhadap Perengkahan Minyak Cangkang Biji Jambu Mete, *For. Prod. J.*, 34(3), p. 189-197.
- Fadhululloh, M.A., Taufik, R., NAndiyanti A.B.D., and Mudzakir, A., 2014, Review Tentang Sintesis SiO₂ Nanopartikel, *J. Integrasi Proses*, 5(1), 30-45.
- Farhan Hanafi, M., and Sapawe, N., 2019, Effect of Calcination Temperatur on the Structure and Catalytic Performance of ZrO₂ Catalyst in Phenol Degradation, *Mater. Today Proc.*, 19, 1533-1536.



- Fechete, I.Y., Wang, J.C., and Ve'drine, 2012, The Past, Present and Future of Heterogeneous Catalysis, *Catal.* 189, 2-27.
- Frickie, J. and A. Emmerling, 1992, *Aerogels, Preparation, Properties, Applications, in Structure and Bonding 77: Chemistry, Spectroscopy and Applications of Sol-Gel Glasses*, Springer, Berlin.
- Garzon, N.N.A., Oliveira, A.A., Hartmann, M.R., and Bazzo, E., 2015, Experimental and thermodynamic analysis of compression ignition engine operating with straight soybean oil, *J. Braz. Soc. Mech. Sci. Eng.*, 37, 1467-1478.
- Gurav, J.L., Jung, I.K., Park, H.H., Kang, E.S., and Nadargi, D.Y., 2010, Silica Aerogel: Synthesis and Applications, *J. Nanomat.*, 31, 1-11.
- Hagar, M., Radwan, N.R.E., Afifi, T.H., Al-wadaani, F., and Okasha, R.M., 2018, Catalytic activity of sulfated and phosphate catalysts towards the synthesis of substituted coumarin, *Catalysts*, 8, 36.
- Ibrahim, A., 2018, An experimental study on using diethyl ether in a diesel engine operated with diesel-biodiesel fuel blend, *Eng. Sci. Techonol. an Int. J.*, 21(5), 1024-1033.
- Iodice, P., Senatore, A., Langella, G., Amoresano, A., 2016, Effect of Ethanol-Gasoline Blends on CO and HC Emission in Last Generation SI Engines Within the Cold-Start Transient: An Experimental Investigation, *Appl. Energy*, 179, p. 182-190.
- Irma, M.D., Wicaksono, S.P., Roesyadi, A., dan Ni'mah, H., 2020, Pra Desain Pabrik Dietil Eter dari Etanol dengan Proses Dehidrasi, *J. Fundam. Appl. Chem. Eng.*, 1(2), 31-34.
- Jafarzadeh, M., Rahman, I.A., and Sipaut, C.S., 2009, Synthesis of Silica Nanoparticles by Modified Sol-Gel Process: The Effect of Mixing Modes of The Reactants and Drying Techniques, *J. Sol-Gel Sci. Tech.*, 50, 328-336.
- Jeevanantham, A.K., Nanthagopal, K., Ashok, B., Al-Muhtaseb, A.H., Thiagarajan, S., Geo, V.E., Ong, H.C., Samuel, K.J., and Chyuan, O.H., 2019, Impact of addition of two ether additives with high speed diesel-Calophyllum Inophyllum biodiesel blends on NOx reduction in CI engine, *Energy*, 185, 39-54.
- Khalaf, H.A., Mekhemer, G.A., Nohman, A.K., and Mansour, S.A.A., 2007, Phosphated Alumina Catalysts: Surface and Reactivity Towards 2-Pr-OH Decomposition, *Monatsh. Chem.*, 138, 641-648.
- Khosravi-Nikou, M. and Bahrami, A., 2015, A New Method for Synthesis of Cobalt-based Nano-catalyst on Titania for Fischer-Tropsch Reaction, *Energy Sources A: Recovery Util. Env. Eff.*, 37, 2041-2046.
- Kirk, R.E., and Othmer, D.F., 1984, *Encyclopedia of Chemical Technology*, The Interscience Encyclopedia Inc., New York.
- Laha, S.C., Mukherjee, P., Sainkar, S.R., and Kumar, R., 2002, Cerium Containing MCM-41 Type Mesoporous Materials and Their Acidic and redox Catalytic Properties, *J. Catal.*, 297(2), 213-223.
- Layla, J.S., Trisunaryanti, W., Purwono, S., Soufyan, A., and Triyono, 2008, Sintesis dan Karakterisasi Katalis NiO-CoO-MoO/Zeolit Alam dan NiO-



- MoO-CoO/Zeolit Alam dan Uji Katalisasi Pada Proses Hidrorengkah Pelumas Bekas, *J. Nat. Sci.*, 18(2), 90-101.
- Lee, S., and Kim, T.Y., 2017, Performance and Emission Characteristics of a DI Diesel Engine Operated with Diesel/DEE Blended Fuel, *Appl. Therm. Eng.*, 121, 454-461.
- Liaquat, A.M., Kalam, M.A., Masjuki, H.H., and Jayed, M.H., 2010, Potential Emission Reduction in Road Transport Sector Using Biofuel in Developing Countries, *Atmos. Environ.*, 44, p. 3869-3877.
- Limamthong, M., Chitpong, N., and Jongsomjit, B., 2019, Influence of Phosphoric Acid Modification on Catalytic Properties of γ - χ Al₂O₃ Catalysts for Dehydration of Ethanol to Diethyl Ether, *Bull. Chem. React. Eng.*, 14(1), 1-8.
- Maki, Y., Sato, K., Isobe, A., Iwasa, N., Fujita, S., and Takezawa, M.S.N., 1998, Structure of H₃PO₄/SiO₂ catalysts and catalytic performance in the hydration of ethane, *Appl. Cataly. A Gen.*, 170, 269-275.
- Mallesham, B., Sudarsanam, P. Venkata, B.R., Govinda, B.R., and Reddy, B.M., 2018, Nanostructured Nickel/Silica Catalysts for Continuous Flow Conversion of Levulinic Acid to gama-Valerolactone, *ACS Omega*, 3, 16839-16849.
- Marosz, M., Samojeden, B., Kowalezyk, A., Rutkowska, M., Motak, M., Diaz, U., Palomares, A.E., and Chmielarz, L., 2020, MCM-22, MCM-36, and ITQ-2 Zeolites with Different Si/Al Molar Ratios as Effective Catalyst of Methanol and Ethanol Dehydration, *Materials*, 12(2399), 2-17.
- Mitova S., and Valtchev, V., 2002, Microporous and Mesoporous Materials, *Micropor. Mesopor. Mater.*, 25(5), 1024-1033.
- Moreno-Martell, A., Pawelec, B., Nava, R., Mota, N., Escamilla-Perea, L., Navarro, R.M., and Fierro, J.L., 2018, CO oxidation at 20 0C on Au Catalysts Supported on Mesoporous Silica: Effects of Support Structural Properties and Modifier, *Materials*, 11(6), 1-25.
- Moussa, N., and Ghorbel, A., 2005, Vanadia-Silica Catalysts Prepaed by Sol-Gel Method: Applicaton for Expoxidation Reaction, *J. Sol-Gel Sci. Technol.*, 33, 127-132.
- Niederberger, M., and Garnweitner, G., 2006, Organic Reaction Pathways in the Non aqueous Synthesis of Metal Oxide Nanoparticles, *Chem. Eur. J.*, 12(28), 7282-7302.
- Ohgushi, T., Komarneni, S., and Bhalla, A.S., 2016, Mechanism of microwave heating of zeolite, *J. Porous Mater.*, 23, 850-857.
- Olson, C., and Lenzmann, F., 2016, The Social and Economic Consequences of the Fossil Fuel Supply Chain, *MRS Energy and Sustain.*, 3(6), 1-32.
- Patterson, J. W., 1997, *Industrial waste water treatment*, Butterworth Science, Stoneham.
- Pertamina, *Inisiatif Strategis Pertamina Wujudkan Energy Hijau*, 21 Februari 2021, Web. Diakses tanggal 16 Juni 2022.
- Phung, T.K., and Busca, G., 2015, Diethyl Ether Cracking and Ethanol Dehydration: Acid Catalysis and Reaction Paths, *J. Chem. Eng.*, 272, 92-101.



- Phung, T.K., Lagazzo, A., Crespo, M.A.R., Escribano, V.S., and Busca, G., 2014, A Study of Commercial Transition Aluminas and of Their Catalytic Activity in Dehydration of Ethanol, *J. Catal.*, 311, 102-114.
- Ramadhan, N.I., Munasir, and Triwikantoro, 2014, Sintesis dan Karakterisasi Serbuk SiO₂ dengan variasi pH dan molaritas berbahan dasar pasir Bancar, Tuban, *J. Sains dan Seni*, 3(1), 15-17.
- Richardson, J.T., 1989, *Principles of Catalyst Development*, 1st edition, Plenum Press, New York.
- Rohmah, R., dan Zainur, M., 2016, Pengaruh variasi temperatur kalsinasi SiO₂ Terhadap Kebasahan pada Permukaan Hidrofobik, *J. Sains dan Seni ITS*, 5(2), 3-6.
- Sakuth, M., Mensing, T., Schuler, J., Heitmann, W., Strehlke, G., and Mayer, D., 2012, Ether Aliphatic, Vol. 13, dalam Ullmann's Encyclopedia of Industrial Chemistry, Wiley-VCH Verlag GmbH &Co. KGaA, Weinheim, 433-449.
- Sarve, D.T., Singh, S.K., and Ekhe, J.D., 2020, Kinetic and mechanistic study of ethanol dehydration to diethyl ether over Ni-ZSM-5 in closed batch reactor, *React. Kinet. Mech. Catal.*, 131, 261-281.
- Sezer, I., 2020, A Review Study on Using Diethyl Ether In Diesel Engines: Effects on Fuel Properties, Injection, and Combustion Characteristics, *Energy Env.*, 31, 179-214.
- Shalaby, N.H., Elsalamony, R.A., and El Nagar, A.M.A., 2018, Mesoporous waste-extracted SiO₂-Al₂O₃-supported Ni and Ni-H₃PW₁₂O₄₀ nano-catalysts for photo-degradation of methyl orange dye under UV irradiation, *New. J. Chem.*, 42, 9177-9186.
- Shinde, P.S., Suryawanshi, P.S., Patil, K.K., Belekar, V.M., Sankpal, S.A., Delekar, S.D., and Jadhav, S.A., 2021, A Brief Overview of Recent Progress in Porous Silica as Catalyst Supports, *J. Compos. Sci.*, 5(75), 1-17.
- Shuang-Hong, X., Xie, H., Ping, H., Qi-Chang, L., Bao-Lian, S., and Zheng-Yi, F., 2015, Induced transformation of amorphous silica to cristobalite on bacterial surfaces, *RSC. Adv.*, 5, 71844-71848.
- Silverstein, Bassler, and Morrill, 1981, *Spectroscopic Identification of Organic Compound*, 4th Edition, New York, John Wiley & Sons.
- Sriyanti, Taslimah, Nuryono, and Narsito, 2005, Sintesis Bahan Hibrida Amino Silika dari Abu sekam Padi Melalui Proses Sol Gel, *J. Appl. Chem.*, 8(1), 1-10.
- Sulastri, S., and Kristianingrum, S., 2010, *Berbagai Macam Senyawa Silika: Sintesis, Karakterisasi dan Pemanfaatan, Penelitian, Pendidikan dan Penerapan MIPA*, Yogyakarta.
- Sunajadevi, K.R., and Sugunan, S., 2004, Synthesis, Characterization and Benzylation Activity of Nanocrystalline Chromia Loaded Sulfated Titania Prepared Via Sol-Gel Route, *Catal. Comm.*, 5, 575-581.
- Susi, E.P., Wijaya, K., Pratika, R.A., and Hariani, P.L., 2020, Effect of nickel concentration in natural zeolite as catalyst in hydrocracking Process of used cooking oil, *Chem. Asian. J.*, 32, 2773-2777.
- Tester, F., Gas Caused (E10) Engine Damage and Performance Issues, 2009, Web. Diakses tanggal 25 Mei 2022.



- Tresatayawed, A., Glinrun, P., and Jongsomjit, B., 2019, Ethanol Dehydration Over WO₃/TiO₂ Catalyst Using Titania Derived from Sol-Gel Precipitation Technique, *Int. J. Chem. Eng.*, 45, 8643-8650.
- Trianasari, Posman, M., and Karo-Karo, P., 2017, Analisis dan Karakterisasi Kandungan Silika (SiO₂) sebagai Hasil Ekstraksi Batu Apung (*Pumice*), *J. Teori dan Aplikasi Fisika*, 5(2), 179-186.
- Trisunaryanti, W., Nur, S.A., Ayu, D.F., Triyono, T., and Cahya, N.N., 2022, Performance of a Hybrid Catalyst from Amine Group and Nickel Nanoparticles Immobilized on Lapindo Mud in Selective Production of Bio-hydrocarbons, *Indones. J. Chem.*, 22(4), 896-912.
- Trisunaryanti, W., Triyono, Raka, N.S., Larasati, S., Paramesti, C., and Ayu, D.F., 2021, Enhancement of Cobalt Concentration Supported on Mesoporous Silica towards the Characteristics and Activities of Catalysts for the Conversion of Waste Coconut Oil into Gasoline and Diesel Oil, *Indones. J. Chem.*, 21(3), 527-536.
- Ullman, 1987, *Ullman's Chemical Engineering and Plant Design*, Wiley&Sns Inc, New York.
- Utami, Q.P., Hasanudin, and Mara, A., 2022, Comparison of Acidity Test Method of Nickel Phosphate Silica Catalyst for Production Levulinic Acid from Glucose, *Indones. J. Fundamental. Appl. Chem.*, 7(3), 106-112.
- Wahyuni, I., 2012, Studi Pemisahan Campuran Azeotrop Etanol-Air dan Isopropyl Alkohol-Air Melalui Proses Pervaporasi dengan Membran Tin Film Composite Komersial, *Tesis*, Fakultas Teknik Prog Studi Magister Teknik Kimia, Depok.
- Widayat, Roesyadi, A., and Rachimoellah, M., 2010, Pengaruh Waktu Dealuminasi dan Jenis Sumber Zeolit Alam Terhadap Kinerja H-Zeolit untuk Proses Dehidrasi Etanol, *J. Chem. Eng.*, 13(1), 51-57.
- Widayat, Roesyadi, A., and Rachimoellah, M., 2013, Diethyl Ether Production Process with Various Catalyst Type, *Int. J. of Sci. and Eng.*, 4(1), 6-10.
- Widayat, Studi Proses Produksi Dietil Eter Dari Etanol Dengan Katalis Zeolit Berbasis Zeolit Alami, *Disertasi*, Institut Teknologi Sepuluh November, Surabaya.
- Wijaya, K., Ariyanti, A.D., Tahir, I., Syoufian, A., Rachamit, A., and Hasanudin, 2018, Synthesis of Cr/Al₂O₃- Bentonite Nanocomposite as the hydrocracking catalyst of Castrol oil, *J. NHC*, 19, 46-54.
- Wijaya, K., Dita, W.S., Taufiik, I.A.A., Wangsa, Heraldy, E., Hakim, L., Suseno, A., and Utami, M., 2021, Mesoporous Silica Preparation Using Sodium Bicarbonate as Template and Application of the Silica for Hydrocracking of Used Cooking Oil into Biofuel, *Silicon*, 1-10.
- Wijaya, K., Laura, M.L.M., Utami, M., Mulijani, S., Patah, A., Cahyo, A.W., Chandrasekaran, M., Ramalingam, J.R., and Al-Lohedan, H.A., 2021, Synthesis, Characterizations and Catalysis of Sulfated Silica and Nickel Modified Silica Catalysts for Diethyl Ether (DEE) Production from Ethanol Towards Renewable Energy Applications, *Catal.*, 11, 1-13.
- Wijaya, K., Nadia, A., Pratiwi, A.F., Tikoalu, A.D., and Wibowo, A.C., 2021, Catalytic Hydrocracking of Fresh and Waste Frying Oil over Ni- and Mo-



- Based Catalysts Supported on Sulfated Silica for Biogasoline Production, *Catal.*, 11(1150),1-15.
- Yaws, C.L., 1999, *Chemical Properties Handbook Physical, Thermodynamic, Environmental, Transport, Safety, and Health Related Properties for Organic and Inorganic Chemicals*, McGraw Hill Book Companies, New York.
- Younes, N.B., Ortigosa, J.M., Marie, O., Blasco, T., and Mhamdi, M., 2021, Effect of Zeolite Structure on The Selective Catalytic Reduction of NO With Amonia over Mn-Fe Supported on ZSM-5, BEA, MOR and FER, *Res. Chem. Intermed.*, 47, 2003-2028.
- Zeng, D., Zhang, Q., Chen, S., Liu, S., Chen, Y., and Wang G., 2015, A novel solid phosphoric acid frim rice hull ash for olefinic alkylation of thiophenic sulphur in gasoline, *Mater. Res. Bull.*, 72, 276-279.
- Zhai, P., Lv. G., Chai, Z., Zhu, Y., Li, H., Zhang, X., and Wang, F., 2019, Efficient Production Of Ethyl Levulinate From Furfuryl Alcohol Catalyzed By Modified Zirconium Phosphate, *ChemistrySelect*, 4, 3940-3947.
- Zhang, M., Wang, R., and Yang, X., 2008, Effect of P Content on the Catalytic Performance of P-modified HZSM-5 catalyst in Dehydration of Ethanol to Ethylene, *Catal. Lett.*, 124, 384-391.
- Zhang, Y., and Liu, Q., 2021, Nickel phyllosilicate derived Ni/SiO₂ catalysts for CO₂ methanation: Identifying effect of silanol group concentration, *J. CO₂ Util.*, 50, 1-14.
- Zhang, Y., and Liu, Q., 2021, Nickel Phyllosilicate derived Ni/SiO₂ catalysts for CO₂ methanation: Identifying effect of silanol group concentration, *J.CO₂ Util.*, 50, 101587.
- Zhuang, Q., and Miller, J. M., 2001, One Pot Sol-Gel Synthesis of Sulfated ZrO₂-SiO₂ Catalysts for Alcohol Dehydration, *Can. J. Chem.*, 79,1220-1223.