

DAFTAR PUSTAKA

- Adhikari, P., Hu, P dan Yafei, Z. 2012. Oxidative stabilities of enzymatically interesterified fats containing conjugated linoleic acid. *J Am Oil Chem Soc* 89:1961–1970.
- Akil, E., Carvalho, T., Bárea, B., Finotelli, P., Lecomte, J., Torres, A.G., Amaral, P., dan Villeneuve, P. 2016 .Accessing regio-and typospecificity of *Yarrowia lipolytica* lipase in its free form and immobilized onto magnetic nanoparticles. *Journal Biochemical Engineering*, 109: 101–111.
- Ali, Z., Tian, L., Zhao, P., Zhang, B., Ali, N., Khan, M and Zhang, Q. 2016. Immobilization of lipase on mesoporous silica nanoparticles with hierarchical fibrous pore. *Journal of Molecular Catalysis B: Enzymatic* 134:129–135.
- Amalia, R., Bulan, R dan Sebayang, F. 2013. Penentuan pH dan suhu optimum untuk aktivitas ekstrak kasar enzim lipase dari kecambah biji karet (*hevea brasiliensis*) terhadap hidrolisis pko (*palm kernel oil*). *Jurnal Saintia Kimia* 1, (2):1-7
- Andre, J.M. 2009. Mixed Matrix Membranes A New Platform for Enzymatic Reaction. Dissertation. University of Twente. Netherlands.
- Anggirasti. 2008. Gliserolisis RBDPO Refined Bleached Deodorized Palm Oil dengan Lipase untuk Sintesis MDAG. IPB Press. Bogor.
- Anonim. 2014. Pemanfaatan stearin sawit dan minyak kelapa untuk formulasi asam lemak mirip asi. ISSN:1412-8004.
- Anonim. 2014. Mengenal Minyak Sawit Dengan Beberapa Karakter Unggulnya. GAPKI. Jakarta.
- Anonim. 2016. Statistik Perkebunan (Kelapa Sawit) Indonesia. Sekretariat Jenderal Perkebunan. Jakarta.
- Aggoro, Dwi dan Faleh., S.T. 2008. Proses gliserolisis minyak sawit menjadi mono dan diacyl gliserol dengan pelarut n-butanol dan katalis MgO. *Jurnal Reaktor*. 12 (1): 23-30

- Akoh, C.C., and Min, D.B. 2008. *FOOD LIPID : Chemistry, Nutrition, and Biotechnology*. CRC Press Taylor and Francis Group, LLC., New York.
- Angkawidjaja, C., Matsumura, H., Koga, Y., Takano, K and Kanaya, S. 2010. Xray crystallographic and MD simulation studies on the mechanism of interfacial activation of a family I.3 lipase with two lids. *J. Mol. Biol.* 400: 82–95.
- Ann, J. 2010. E nzyme Immobiliation on Woolen Cloth. Thesis Department of Chemical and Materials Engineering The University of Auckland. New Zealand.
- Bastida, A. Sabuquilo, P., Armisen, P., Fernandez-Lafunte, R., Huguet, J., dan Guisan, J.M. 1998. A single step purification, immobilization and hyperactivation of lipases via interfacial adsorbtion on strongly hydrophobik supports. *Biotechnology and Bioengineering* 5: 486-493.
- Bayramoglu, G., Akbulut, A., Ozalp, V.C., dan Arica, M.Y. 2015. Immobilized lipase on micro-porous biosilica forenzymatic transesterification of algal oil. *J. chemical engineering research and design* 95: 12–21
- Berry, E.E., Woodward, R., Yeoh, C., Miller, G.J dan Sanders, T.A.B. 2007. Effect of intersterification of palmitic acid-rich triacylglycerol on postpandrial lipid and factor VII response. *Lipids* 42:315-323.
- Byun, Hee Guk, Eom, T., Jung, W., dan Kim, S.K. 2007. Lipase catalyzed production of monoacylglycerols by the esterification of fish oil fatty acids with glycerol. *Biotechnology and Bioprocess Engineering*, 12:491-496.
- Chang M.K, Abraham G, dan John V.T. 1990. Production of cocoa butter-like fat from interesterification of vegetable oils. *J Am Oil Chem Soc* 67:135-140.
- Chen, G., Kuo, C., Chen, C., Yu, C., Shieh, C dan LiUu, Y. 2012. Effect of membranes with various hydrophobic/hydrophilic properties on lipase immobilized activity and stability. *J of Bioscience and Bioengineering*. 113 (2): 166–172.
- Chen, W.C., Lai, M.O., Ghazali, M.H dan Chong, L.C. 2002. Isothermal crystallization kinetics of refined palm oil. *JAACS*. 79 (4):150-157
- Cheirsilp, B., Jeamjounkhaw, P., dan Kittikun, H.A. 2009. Optimizing an alginate immobilized lipase for monoacylglycerol production by the glycerolysis reaction. *J. Mol. Catal. B Enzym.* 59: 206-211.

- Christakopoulos, P., Constantina Tzia, Dimitris Kekos, dan basil J. Macris, 1992, Production and characterization of extracellular lipase from *Calvatia gigantea*, *Appl Microbiol Biotechnol*, 132:194-197.
- Cho, H.Y., Bancierz, R. Ginalska, G., Leonowicz, A., Cho, N.S., dan Ohga, S. 2007. Culture Condition of Psychrotrophic Fungi *Penicillium Chryogenum* and Its Lipase Characteristic. *J.Fac. Agr. Kyushu Univ.* 52: 281-286.
- Chu, S.B., Ghazalia, M.H., Lai, M.O., Che Man, B.Y., Yusof, S., Tee, B.S., and Yusoff. A.S.M. 2001. Comparison of lipase-transesterified blend with some commercial solid frying shortenings in malaysia. *JAOCS*, 78, (12): 174-182
- Coker. 2001. Modeling of chemical inetics and reactor design. Gulg Publishing Company, Houston: Texas.
- Copeland, R.A. 2000. Enzymes: A Practical Introduction to Structure, Mechanism and Data Analysis. Wiley-VCH. Inc. New York.
- Coteron, A., Martinez, M., dan Aracil J. 1998. Reaction of olive oil and glycerol over immobilized lipases. *JAOCS*. 75:657-660.
- Damstrup, M.L., Jensen, F.V., Spars, S.Z., Kiil, A.D., dan Jensen, Xu, X. 2006. Production of heat-sensitive monoacylglycerols by enzymatic glycerolysis in tert-pentanol: process optimization by response surface methodology. *JAOCS* 83:27-33.
- Daniel RM, HS Toogood dan PL Bergquist. 1995. Thermostable proteases. *Biotechnol Gen Engineer Rev* 13, 51-100.
- Daniel RM, Danson MJ. 2013. Review: Temperature and the catalytic activity of enzymes: A fresh understanding. *FEBS Letters*. 587: 2738–2743.
- Day, R.A dan A.L Underwood. 1989. Analisa kimia kuantitatif edisi kelima. Erlangga. Jakarta.
- Dziezak, J.D. 1988. Microencapsulation and encapsulated ingredients. *J. Food Technology*. 28(4):138.
- Elfman-Borjesson, Inger, dan Harrod, M. 1999. Sythesis of monoglycerides by glycerolysis of rapeseed oil using immobilized lipase. *JAOCS* 76 (6): 701-707.
- Facioli, N.I dan Barrera, A.D. 2001. Optimization of enzymatic esterification of soybean oil deodoriser distillate. *J Sci Food Agric* 12: 1193-1198.

- Fajardo, R.A., Akoh, C.C dan Lai, M.O. 2003. Lipase-catalyzed incorporation of n-3 PUFA into palm oil. *JAOCs* 80 (12): 153-161
- Fennema. 1996. Food Chemistry. 3th Edition. Marcel Dekker. Inc. New York.
- Freitas, L., Paula, V.A., Santos, C.J., Zanin, M.G., dan de-Castro, F.H. 2010. Enzymatic synthesis of monoglycerides by esterification reaction using *Penicillium camembertii* lipase immobilized on epoxy SiO₂-PVA composite. *Journal of Molecular Catalysis B: Enzymatic* 65: 87–90.
- Freitas, L., Patricia C.M., Da Ro' s, Santos, C. J., Heizir, F., deCastro. 2009. An integrated approach to produce biodiesel and monoglycerides by enzymatic interestification of babassu oil (*Orbinya* sp). *Journal Process Biochemistry* 44: 1068–1074
- Forgety, A.C. 1971. Noctromatographic Methods for the Separation and Analysis of Lipids. Di dalam A.R. Johnson dan J.B. Davenport (eds). *Biochemistry and Methodology of Lipids*. Willey-Interscience. New York.
- Gandhi, N.N. 1997. Application of Lipase. *JAOCs*. AOCS Press
- Galúcio, S.C., Souza, A.R., Stahl, A.M., Sbaite, P., Benites, I.C., dan Maciel, W.R.M. 2011. Physicochemical characterization of monoacylglycerols from sunflower oil. *J. Procedia Food Science* 1459-1464.
- Gao, Z., Chu, J., Jiang, T., Xud, T., Wu, B., dan Bingfang H. 2018. Lipase immobilization on functionalized mesoporous TiO₂: Specific adsorption, hyperactivation and application in cinnamyl acetate synthesis. *J. Process Biochemistry* 64: 152–159
- Ghamgui, H., Miled, N., Reba, R., Karra-cha[^]abouni, M dan Gargouri, Y. 2006. Production of mono-olein by immobilized *Staphylococcus simulans* lipase in a solvent-free system: Optimization by response surface methodology. *Journal Enzyme and Microbial Technology* 39: 717–723.
- Ghattas, N., Abidi, F., Galai, S., Marzouki, N.M., dan Salah, B.A. 2014. Monoolein production by triglycerides hydrolysis using immobilized *Rhizopus oryzae* lipase. *International Journal of Biological Macromolecules* 68 1–6.
- Goli, S.A.H., Sahri, M.M dan Kadivar, M. 2008. Enzymatic interesterification of structured lipids containing conjugated linoleic acid with palm stearin for possible margarine production. *European J. Lipid Sci. Technol.* 110:1102-1108.

- Gregersen, B.S., Miller, L.R., Hammershøj, M., Andersen, D.M., dan Wiking, L. 2015. Texture and microstructure of cocoa butter replacers: Influence of composition and cooling rate. *Journal Food structure* 4: 2-15.
- Guedes, M.M.A., Ming, C.C., Ribeiro, B.P.A., da Silva, C.R., Gioielli, A.L., dan Goncalves, G.A.L. 2014. Physicochemical properties of interesterified blends of fully hydrogenated crambe abyssinica oil and soybean oil. *J Am Oil Chem Soc* 91:111–123.
- Gunstone, F.D dan F.B. Padley. 1997. *Lipids Technologies and Applications*. Marcel Dekker Inc. New York.
- Gunstone, F.D. 2008. *Oil and Fats in The Food Industry*. United Kingdom.
- Hartley, C.W.S. 1992. *The Oil Palm*. New York: John Wiley and Sons inc.
- Hazirah , S., Fauzi, M., Rashid, A.N dan Omar, Z. 2013. Effects of enzymatic interesterification on the physicochemical, polymorphism and textural properties of palm stearin, palm kernel oil and soybean oil blends. *Journal of Bioscience, Biochemistry and Bioinformatics*, 3 (4): 221-228
- Hasenhuettl GL. 1997. Overview of Food Emulsifier. In : *Food Emulsifier and Their Applications*. G.L. Hasenhuettl dan R.W. Hartel (Eds.). Chapman & Hall, New York.
- Hermansyah, H., Wijanarko, A., Dianursanti., Gozan, M., Wulan., Arbanti, R., Soemantojo, R.W., Utami, T.S., Yuliusman., Kubo, M., Shibashaki Kitawa, N., dan Yonemoto, T. 2007. Kinetic model for trygliserida hidrolisis using lipase: reviu. *Makara Teknologi*. 11:30-35.
- Herlina, N dan H. S. Ginting, 2002. *Lemak dan Minyak*. Fakultas Teknik Jurusan Teknik Kimia USU, Medan.
- Hermida, L., Abdullah, Z.A., dan Mohamed, R.A. 2011. Synthesis of monoglyceride through glycerol esterification with lauric acid over propyl sulfonic acid post-synthesis functionalized SBA-15 mesoporous catalyst. *Journal Chemical Engineering* 174: 668– 676.
- Hidayat, C., Supriadi dan Probondari. 2009. Pengembangan zirkonia agarosa sebagai matrik untuk biokatalis pada amobilisasi lipase *Candida Rugosa*. *Jurnal Agritech* vol 29.
- Hilmato, H., Hidayat, C., and Hastuti, P. 2016. Surface modification of macroporous matrix for immobilization of lipase for fructose oleic ester synthesis. *Bulletin of Chemical Reaction Engineering and Catalysis* 11 (3) 339-345.

- Hui, Y. H., 1996. *Bailey's Industrial Oil and Fat Products Vol 4. edible Oil and Fat Products: Processing Technology*. John Wiley & Sons, New York.
- Hwang, S., Lee, T.K., Park, J.W. Min, R.B., Haam, S., Ahn, I., dan Jung, J. 2004. Stability analysis of *Bacillus stearothermophilus* L1 lipase immobilized on surface-modified silica gels. *Journal Biochemical Engineering* 17. 85–90.
- Idris, N.A dan Dian, N.L.H.M. 2005. Interesterified palm products as alternatives to hydrogenation. *Asia Pac. J. Clin. Nutr.* 14 (4): 396-401
- Jaiswal, N., Pandey, P.V dan Dwivedi, N.U. 2016. Immobilization of papaya laccase in chitosan led to improved multipronged stability and dye discoloration. *Journal of Biological Macromolecules* 288–295.
- Jenab, E., Temelli, F , dan Curtis, M.J. 2013. Lipase-catalysed interesterification between canola oil and fully hydrogenated canola oil in contact with supercritical carbon dioxide. *J. Food Chemistry* 141: 2220–2228.
- Jeyarani, T dan Reddy, Y.S. 2003. Preparation of plastic fats with zero *trans* FA from palm oil. *JAACS* 80 (11): 97-104
- Jin, Q., Zhang, T., Shan, L., Liu, Y., dan Wang, X. 2008. Melting and solidification properties of palm kernel oil, tallow, and palm olein blends in the preparation of shortening. *J Am Oil Chem Soc* 85:23–28.
- Joyce, P., Kempson, I., dan Prestidge, C.A. 2016. Orientating lipase molecules through surface chemical control forenhanced activity: A QCM-D and ToF-SIMS investigation. *Journal Colloids and Surfaces B: Biointerfaces* 142: 173–181.
- Kaewthong. W. 2005. Continuous production of monoacylglycerols by glycerolysis of palm olein with immobilized lipase. *Journal of Process Biochemistry Elsevier* 4:1525-1530.
- Karabulut, I., Turan, S., dan Ergin, G. 2004. Effect of Chemical Interesterification on Solid Fat Content and Slip Melting Point of Fat/Oil Blend. *Eur Food Res Technol*, 218, 224-229.
- Katsuragi, Y., Yasukawa, T., Matsuo, N., Flickinger, B. D., Tokimitsu, I., dan Matlock, M. G. 2004. Diacylglycerol oil. AOCS Press. Champaign New York.
- Ketaren, S. 1986. Pengantar Teknologi Minyak dan Lemak Pangan. UI-Press. Jakarta.
- Kimmel, T. 2004. Kinetic Investigation of The Base-Catalyzed Glycerolysis of Fatty Acid Methyl Ester. Genehmigte Dissertation. Technischen Universitat Berlin. German.

- Krajewska, B. 2004. Application of chitin and chitosan-based material for enzyme immobilization: a review. *Enzyme. Microb. Technol* 126-139.
- Ledo, M.E.S. 2012. Evaluasi Penggunaan Matrik Silica-Polyethylenimine dan Silica-Polyethylenimine-2-phenylpropionaldehyde untuk Amobilisasi Lipase *Aspergillus Niger* 6516 Untuk Sintesis Etil Ester Asam Oleat. *Thesis*. Program Pasca Sarjana UGM. Jogjakarta.
- Lee, A.S.M., Haque, T., Kim, S., Lee, Y., dan Chun, B. 2014 . Effect of reaction parameters on conversion of krill (*Euphausia superba*) oil by immobilized lipase ethanolysis. *Journal of Industrial and Engineering Chemistry* 20: 1097–1102.
- Lee, J.M. 1992. Biochemical Engineering. New Jersey. Prentice Hall Inc.
- Lehninger, A.L., 1993. Dasar-Dasar Biokimia Jilid 1. Maggy Thenawijaya (Penerjemah). Erlangga. Jakarta.
- Lewis, M. J. 1987. Physical Properties of Food Processing System. New York: Academic Press.
- Li, D., Adhikari, P., Shin, A.J., Lee, H.J., Kim, J.Y., Zhu, M.X., Hu, N.J., Jin, J., Akoh, C.C., dan Lee, T.K. 2010. Lipase-catalyzed interesterification of high oleic sunflower oil and fully hydrogenated soybean oil comparison of batch and continuous reactor for production of zero trans shortening fats. *J. Food Science and Technology* 43: 458–464.
- Lindsay., R.C. 1985. Food Chemistry. Marcel Dekker. Inc. New York.
- Li, P., Wang, T., Lei, F., Zeng, Q., Li, H., dan Jiang, J. 2016. Lipase immobilized on rosin-based functional polymers as biocatalyst for the synthesis of ethyl dodecanoate. *Journal of Molecular Catalysis B: Enzymatic* 133: 106–113.
- Li, W.N., Chen, B.Q dan Tan, T.W. 2001. Esterification synthesis of ethyl oleate in solvent-free system catalyzed by lipase membrane from fermentation broth. *Appl Biochem Biotechnol* 163:102-111.
- Long K *et al.* 2003. Effect of enzymatic transesterification with flaxseed oil on the high-melting glycerides of palm stearin and palm olein. *J Am Oil Chem Soc* 80(2):133-137.
- Luna, P dan Andar, N. 2013. Potensi produk monoaglisierol sebagai emulsifier nabati. *Buletin Teknologi Pascapanen Pertanian* 9: 108-116.
- Lurgi, G. 1989. Titik Leleh dan Titik Beku Lipid. Yrama Widya. Bandung.

- Mashura. 2015. Peranan enzim lipase dari dedak padi sebagai katalis pada pembentukan monogliserida secara gliserolisis minyak inti sawit dan RBD stearin. *Jurnal Agrium ISSN 2442-7306* 19 (3): 1-7
- Masuchi, H.M., Gandra, M.K., Marangoni, L.A., de Sa´ Perenha, C., Chiu, C.M., Grimaldi, R., dan Goncalves., G.A.L. 2014. Fats from chemically interesterified high-oleic sunflower oil and fully hydrogenated palm oil. *J Am Oil Chem Soc* 91:859–866.
- Monteiro, J.B., Nasciminto, M.G dan Ninow, J.L. 2003. Lipase catalyed syntesis of monoacylglycerol in a homogeneous system. *J Biotech. Letters* 25: 641-644.
- Messing, R.A. 1975. Immobilized Enzymes for Industrial Reactor. Academic Press. New York.
- Mounika, C and Redyy, S.Y. 2012. Specialty fats enriched with behenic and medium chain fatty acids from palm stearim by lipase acidolysis. *Journal of the American Oil Chemists' Society* 1691-1697.
- Mojovic, L., Knezevic, Z., Popadic, R., and Jovanovic, S. 1998. Immobilization of lipase from *Candida rugosa* on a polymer support. *Journal Appl Microbiol Biotechnol* 50: 676-681.
- Moran, D.P.J dan K.K. Rajah. 1994. Fats in Food Products. Chaphan Hall. New York.
- Nelson, David L dan Cox, Michael M. 2004. Lehninger Principles of Biochemistry 4th ed. W.H. Freeman
- Norizzah, A.R., Chong, C.L., Cheow, C.S., Zaliha, O. 2004. Effect of chemical interesterification on physicochemical properties of palm stearim and palm kernel olein blends. *Journal Food Chemistry* 86: 229-235.
- Noureddini, H. and D. Zhu.1997. Kinetics of transesterification of Soybean Oil, *J.Am Oil Chem. Soc* 74:1457-1463.
- Nicoletti, G., Cipolatti, P.E., Vale´rio, A., Carbonera, G.T.N., Soares, S.N., Theilacker, E., Ninow, L.J., dan de-Oliveira, D. 2015. Evaluation of different methods for immobilization of *Candida antarctica* lipase B (CalB lipase) in polyurethane foam and its application in the production of geranyl propionate. *Journal Bioprocess Biosyst Eng* 38: 1739–1748.

- Oliveira, P.C., Alves, G., dan Castro, H. 2000. Immobilization studies and catalytic properties of microbial lipase onto styrene-divinylbenzene copolymer. *Journal Biochemical Engineering*, 5, issue, 63-71.
- Ozturk, B. 2001. Immobilization of lipase from candida rugosa on hydrofobic and hydrophilic support. Izmir Institute of Technology. Turkey.
- Pahan, I. 2006. Kelapa Sawit. Penebar swadaya. Bogor.
- Pantzaris, T.P. 1994. *Pocket Book of Palm Oil Uses*. Kuala Lumpur: PORIM
- Parshad, R. Bhushan, I., Qazi, G.N., dan Gupta V.K. 2008. Immobiliation of Lipase by Entrapment in Ca-Alginat Beads, *J. Bioact. Compat. Polym* 552-562.
- Patel, A. Varsha, B., and Namita, S. 2013. Biodiesel Production By Esterification of Free Fatty Acid Over Sulfated Zirconia. *Journal Renewable Technology* 51: 227-233.
- Pelczar. M. J., dan Chan, E. S. 1986. *Dasar – Dasar Mikrobiologi*. UI Press. Jakarta.
- Pera, L.M., Romerco, C.M., Baigori, M.D dan Castro, G.R. 2006. Catalytic properties of lipase extrats from aspergillus niger. *J Food Technol. Biotechnol.* 44: 247-252.
- Poedjiadi, A. 1994. *Dasar-dasar Biokimia*. UI-Press. Jakarta.
- Prakoso, T dan Sakanti, M.M. 2007. Pembuatan monogliserida. *Jurnal Teknik Kimia Indonesia.* 6 (3): 1-8.
- Pratiwi, D., Sebayang, F dan Jamilah, I. 2013. Produksi dan karakterisasi enzim lipase dari *Pseudomonas aeruginosa* dengan menggunakan induser minyak jagung serta kofaktor Na⁺ dan Co²⁺. *Jurnal Sainia Kimia* 1 (2): 1-5.
- Prazeres, J.N., Crus, J.A.B., dan Pastore, G.M. 2006. Characterization of alkaline lipase from fusarium oxysporum and the effect of different surfactants and detergents on the enzyme activity. *J. Microbiol.* 37: 505-509.
- Prince, N.C dan Stevens, L., 1982. *Fundamentals of Enzymologi*. Oxford University Press. New York.

- Ramami, K., Boopathy, R., Vidya, C., Kennedy, L.J., Velan, M., dan Sekaran, G. 2010. Immobilization of *Pseudomonas Gerssardi* Acidic Lipase Derived from Beef Tallow onto Mesoporous Activated Carbon and Its Application on Hydrolysis of Olive Oil. *Proces Biotechnol.* 45: 986-992.
- Ratmaningsih, N. 2004. Pengaruh variasi konsentrasi alginat dan konsentrasi lipase terhadap aktivitas hidrolisis dan aktivitas spesifik lipase amobil pada proses amobilisasi lipase dari *Rhizopus delemar*. *Jurnal Penelitian Saintek* 9 (1): 31-50.
- Reshma, M.V., Saritha, S.S., Balachandran, C., dan Arumughan, C. 2008. Lipase catalyzed interesterification of palm stearin and rice bran oil blends for preparation of zero trans shortening with bioactive phytochemicals. *J.Bioresources Technol.* 99:5011-5019.
- Reetz, M. T., Zonta, A dan Simpelkamp, J. 1996. Efficient immobilization of lipases by entrapment in hydrophobic sol-gel materials. *Journal Biotechnology and Bioengineering* 49: 527-534.
- Rousseau, D., dan Marangoni, A.G. 2002. Chemical Interesterification of Food Lipids : theory and practice. In C. C. Akoh, dan B. M. D, Food Lipids:Chemistry, Nutrition and Biotechnology. Marcel Dekker Inc, New York.
- Sana, Hossin I., Haque E.M. dan Shaha R.K. 2004. Identification, purification and characterization of lipase from germination oil seed (*Brassica napus* L.) Pakistan. *Journal of Biological Sciences.* 7 (2): 246-252.
- Segel, I. H. 1993. Enzyme Kinetic, Behavior and Analysis of Rapid Equilibrium and Steady-State Enzyme System. New York: John and Willey Sons. Inc.
- Sellappan, S dan Akoh, C.C. 2000. Enzymatic acidolysis of tristearin with lauric and oleic acids to produce coating lipids¹. *JAACS*, 77 (11): 234-241.
- Sharma, R., Chisti, Y., dan Banerjee, C.U. 2001. Production, Purification, Characterization, and Application of Lipases. *Biotechnol. Advan.* 19: 627-662.
- Sharon, C, S., Furugoh, T., Yamakido, H.I., Ogawa dan Y. Kato. 1998. Purification and characterization of a lipase from *Pseudomonas aeruginosa* KKA-5 and its role in castor oil hydrolysis. *Journal of Industrial Microbiology & Biotechnology.* 20: 304-307.

- Shin, J., Akoh, C.C dan Lee, K. 2010. Physicochemical properties of lipase-catalyzed interesterified fat containing α -linolenic acid. *J Am Oil Chem Soc* 87: 647–657.
- Shi, Y., Liang, B., dan Hartel, R. 2005. Crystal morphology, microstructure, and textural properties of model lipid systems. *Journal of the American Oil Chemists Society*, 82, 399–408.
- Silalahi, J. 2006. *Fats and Oils: Modification and Substitution*. Lecture Notes. Postgraduate Section. Universitas Sumatera Utara. Medan.
- Silalahi, J. 2000. Hypocholesterolemic Factors in Foods. A Review. *Indonesian Food Nutrition Progress*. 7(1):26-36.
- Silalahi, J., dan Tampubolon, S.D.R. 2002. Asam lemak trans dalam makanan dan pengaruhnya terhadap kesehatan. *Jurnal Teknologi dan Industri Pangan*. 8 (2):184-188.
- Silva, C.R., Soares ,F.D., Lourenço, B.M., Soares, M.S.A.F., Silva,G.K., Gonçalves, A.I.M., dan Gioielli, A.L. 2010. Structured lipids obtained by chemical interesterification of olive oil and palm stearin. *J. Food Science and Technology* 43: 752–758.
- Soekapitojo, S., Hariyadi, P., Muchthadi, R.T dan Andarwulan, N. 2008. Interesterifikasi enzimatis campuran minyak sawit untuk produksi cocoa butter equivalent: analisis komposisi triasilgliserol dan solid fat content. ISBN 978-979-95249-7-3.
- Solaesa, G.A., Sanz, T.M., Beltrán, S dan Melgosa, R. 2016. Kinetic study and kinetic parameters of lipase-catalyzed glycerolysis of sardine oil in a homogeneous medium. *Chinese Journal of Catalysis* 37 : 596–606
- Sugiono., Wibowo, M., Soekapitojo, S., dan Wulandari, N. 2012. Pembuatan bahan baku spreads kaya karoten dari minyak sawit merah melalui interesterifikasi enzimatis menggunakan reaktor batch. *J. Teknol.dan Industri Pangan* 23 (2): 1-7
- Suhardi. 2003. Penggunaan getah pepaya dalam sintesis ester xilitol asam lemak (exal). *Jurnal Teknol dan Industri Pangan*. 19: 1-7
- Sun, J., Jiang, Y., Zhou, L dan Gao, J. 2010. Immobilization of *Candida antarctica* Lipase B by Adsorption in Organic Medium. *New Biotechnology* 27(1):53-58.

- Stryer dan Lubert. 1988. Protein Synthesis Biochemistry. W.H. Freeman and Company. New York.
- Suharyanto, Tri-panji dan Perwitasari, U. 2011. Optimasi produksi diasilgliserol dari *crude palm oil* menggunakan lipase spesifik 1,3-gliserida dari *Rhizopus oryzae* TP-2. *Menara Perkebunan*, 79 (1): 23-29.
- Supriyatna, A., Amalia, D., Jauhari, A.A., dan Holydaziah, D. 2015. Aktivitas enzim amilase, lipase, dan protease dari larva. *ISSN 1979-8911*.
- Su'i, M., Harijono., Yunianta dan Aulani'am. 2013. Kondisi optimum enzim lipase kasar dari kentos kelapa. *J. Rekapangan* Vol. 7 No. 1.
- Syaiful., Hekmuseta, W dan Hoesadha, A. 2010. Hidrolisa enzimatik pada crude palm oil penentuan kondisi operasi, permodelan, dan penentuan koefisien kapasitas. *Jurnal Teknik Kimia*, No. 1(17): 1-8
- Syaiful., Amelia, S., dan Zulkarnain, A. 2009. Hidrolisa Minyak Jagung (Corn Oil) Secara Enzimatik, Penentuan Kondisi Operasi Optimum, Permodelan Matematik Dan Penentuan Konstanta Kapasitas. *Jurnal Teknik Kimia*, 3 (16): 1-7
- Tri-Panji., Suharyanto dan Arini, N. 2008. Lipase spesifik 1,3-gliserida dari fungi lokal untuk biokonversi CPO menjadi diasilgliserol. *Menara Perkebunan* 76: 11-22.
- Yassin, A.A.A., Mohamed, O.I., Ibrahim, N.M., dan Yusoff., A.S.M. 2003. Effect of enzymatic interesterification on melting point of palm olein. *J Applied Biochemistry and Biotechnology* 110: 189-197
- Yang, T., Fruekilde, M dan Xu, X. 2003. Applications of immobilized *Thermomyces lanuginosa* lipase in interesterification. *JAACS* 80, 881–887.
- Ye, P., Jiang, J dan Xu, Z. 2007. Adsorption and activity of lipase from *Candida rugosa* on the chitosan-modified poly(acrylonitrile-co-maleic acid) membrane surface. *J Colloids and Surfaces B: Biointerfaces* 62–67.
- Wainwright, B. 1999. Speciality Fats and Oil. Di dalam N. Widlak (ed). *Physical Properties of Fats Oil and Emulsier*. Am Oil Chem. Soc. Press, Champaign, Illinois.
- Wardoyo, A.F., Raharjo, J.T dan Swasono, T.R. 2015. Uji stabilitas enzim lipase terimobilisasi pada kitosan serbuk melalui teknik taut silang. *ISSN 2407-9189*.

- Watanabe, T. M. 2003. Optimization of Reaction Condition far the production of DAG using immobilized 1,3-regiospesific lipase lipozyme RM IM. *JAACS*. (80)1201-1208.
- Wei,W., Feng,Y., Zhang,X., Cao, X and Feng, F. 2015 .Synthesis of structured lipid 1,3-dioleoyl-2-palmitoylglycerol in both solvent and solvent-free system. *J. Food Science and Technology* 60: 1187-1194.
- Whitaker, J.R. 1994. Principles of Enzymology for The Food Science 2nd Edition. New York: Marcel Dekker, Inc.
- White, M.D. 2009. Dietary fatty acids. *J American Family Physician*. 80(4):345-350.
- Willis WM, Marangoni AG. 2002. Enzymatic interesterification. Di dalam: Akoh CC, Min DB, editor. *Food Lipid: Chemistry, Nutrition and Biotechnology*. New York: Marcell Dekker. hlm 839-870.
- Winarno, F.G. 2002. Kimia Pangan dan Gizi. Gramedia Pustaka Utama. Jakarta.
- Winkler, F.K., Arcy, A.D., and Huniker, W. 1990. *Nature*, 343, 771-774.
- Zhao, K., Cao, X., Di, Q., Wang, M., Cao, H., Deng, L., Liu, J., Wang, F., and Tan, T. 2017. Synthesis, characterization and optimization of a two-step immobilized lipase. *Journal Renewable Energy* 103: 383-387.
- Zainal, Z dan Yusoff, A.M. 1999. Enzymatic Interesterification of Palm Stearin and Palm Kernel Olein. *JAACS*, 76 (9):159-167
- Zhao, Y., Liu, J., Deng, L., Wang, F., dan Tan, T. 2011.Optimization of candida sp. 99-125 lipase catalyzed esterification for synthesis of monoglyceride and diglyceride in solvent-free system. *Journal of Molecular Catalysis B: Enzymatic* 72: 157-162.
- Zhang, H., Smith, P dan Adler-nissen., J. 2004. Effects of degree of enzymatic interesterification on the physical properties of margarine fats: solid fat content, crystallization behavior, crystal morphology, and crystal network. *J. Agric. Food Chem* 4423-4431.
- Zhu, J and Sun, G. 2012. Lipase immobilization on glutaraldehyde-activated nanofibrous membranes for improved enzyme stabilities and activities. *Journal Reactive & Functional Polymers* (72) 839–845.

Zou, X., Huang, J., Jin, Q., Liu, Y., Song, Z., dan Wang, S. 2012. Lipase-catalyzed synthesis of human milk fat substitutes from palm stearin in a

continious packed bed reactor. *Journal of the American Oil Chemists' Society*. 89:
1463-1472.