

Referencias

- Adlercreutz D. y Wehtje E. (2001). A simple HPLC method for the simultaneous analysis of phosphatidylcholine and its partial hydrolysis products 1- and 2-acyl lysophosphatidylcholine. *Journal of the American Oil Chemists' Society*, 78 (10) 1007-1011.
- Albasi C., Bertran N. y Riba J. P. (1999). Enzymatic hydrolysis of sunflower oil in a standardized agitated tank reactor. *Bioprocess Engineering*, 20, 77-81.
- Albasi C., Sokolovska I., Riba J. P. y Bales V. (1997). Enzymatic hydrolysis of sunflower oil: characterization of interface. *Journal of Chemical Technology and Biotechnology*, 69, 329-336.
- Al-Duri B., Robinson E., McNerlan S. y Baille P. (1995). Hydrolysis of edible oils by lipases immobilized on hydrophobic supports: effects of internal support structure. *Journal of the American Oil Chemists' Society*, 72 (11), 1351-1359.
- Aloulou A., Rodríguez J. A., Fernández S., van Oosterhout D., Puccinelli D. y Carriere F. (2006). Exploring the specific features of interfacial enzymology based on lipase studies. *Biochimica et Biophysica Acta*, 1761, 995-1013.
- Al-Zuhair S., Ramachandran K. B. y Hasan M. (2004a). High enzyme concentration model for the kinetics of hydrolysis of oils by lipase. *Chemical Engineering Journal*, 103, 7-11.
- Al-Zuhair S., Ramachandran K. B. y Hasan M. (2004b). Investigation of the specific interfacial area of a palm oil-water system. *Journal of Chemical Technology and Biotechnology*, 79, 706-710.
- Al-Zuhair S., Ramachandran K. B. y Hasan M. (2008). Effect of enzyme molecules covering of oil-water interfacial area on the kinetic of oil hydrolysis. *Chemical Engineering Journal*, 139, 540-548.
- Anderson D. (1996). Degumming and lecithin refining. Emerging technologies, current practices, quality control, technology transfer and environmental issues.

Referencias

Proceedings of the world conference on oilseed and edible oils processing, 1, 60-63.

Anderson D. (2005). A primer on oil processing technology. Bailey's industrial oil and fat products. Sexta edición, vol. 6, 1-56.

AOCS. (2001). Official methods and recommended practices of the American Oil Chemists' Society. Firestone, AOCS Press. Sección J.

AOCS. (1993). Official Methods and Recommended Practices of the American Oil Chemists` Society. Determination of mono- and diglycerides by capillary gas chromatography. Cd 11b-91. Sampling and analysis of commercial fats and oils.

Arboleya J. C., Ridout M. J. y Wilde P. J. (2009). Rheological behaviour of aerated palm kernel oil/water emulsions. Food Hydrocolloids, 23, 1358-1365.

Bagi K., Simon L. M. y Szajáni B. (1997). Immobilization and characterization of porcine pancreas lipase. Enzyme and Microbial Technology, 20, 531-535.

Balashev K. , DiNardo N. J., Callisen T. H., Svendsen A., Bjornholm T. (2007). Atomic force microscope visualization of lipid bilayer degradation due to action of phospholipase A₂ and *Humicola lanuginosa* lipase. Biochimica et Biophysica Acta. Biomembranes, 1768 (1), 90-99.

Balcão V. M., Kemppinen A., Malcata F. X., y Paavo J. K. (1998). Modification of butterfat by selective hydrolysis and interesterification by lipase: process and product characterization. Journal of the American Oil Chemists' Society, 75 (10) 1347-1358.

Balcão V. M., Paiva A. L. y Malcata F. X. (1996). Bioreactors with immobilized lipases: state of the art enzyme and microbial technology. Enzyme and Microbial Technology, 18, 392-416.

Bati N., Hammond E. G. y Glatz B. A. (1984). Biomodification of fats and oils: trials with *Candida lipolytica*. Journal of the American Oil Chemists' Society, 61 (11), 1743-1746.

Referencias

- Billaud F., Guitard Y., Tran Minh A. K., Zahraa O., Lozano P., Pioch D. (2003). Kinetic studies of catalytic cracking of octanoic acid. *Journal of Molecular Catalysis A: Chemical*, 192, 281-288.
- Blanco A. (1997). Química biológica. Capítulo siete. Quinta edición. El Ateneo. Buenos Aires.
- Blasi F., Cossignani L., Simonetti M. S., Bruttì M., Ventura F., Damiani P. (2006). Enzymatic deacylation of 1,2-diacyl-sn-glycero-3-phosphocholines to sn-glycerol-3-phosphocholine. *Enzyme and Microbial Technology*, 39 (7), 1405-1408.
- Bloch S. (1990). Desarrollos recientes en el desgomado y la neutralización de aceites vegetales. "A & G" Aceites y Grasas. Año I - Número I.
- Bockisch M. (1998). *Fats and Oils Handbook*. AOCS Press.
- Bockris J. O. y Drazic D. (1972). *Electrochemical science*. Taylor & Francis LTD 22-78.
- Bornscheuer U. T. (1995). Lipase- catalyzed syntheses of monoacylglycerols - Review. *Enzyme and Microbial Technology*, 17, 578-586.
- Bornscheuer U. T., Bessler C., Srinivas R. y Krishna S. H. (2002). Optimizing lipases and related enzymes for efficient application – Review. *Trends in Biotechnology*, 20 (10), 433-437.
- Bourne Y., Martinez C., Kerfelec B., Lombardo D., Chapus C. y Cambillau C. (1994). Horse pancreatic lipase. The cristal structure refined at 2.3 Å resolution. *Journal of Molecular Biology*, 238, 709-732.
- Brady L., Brzozowski A. M., Derewenda Z. S., Dodson E., Dodson G., Tolley S., Turkenburg J. P., Christiansen L., Huge-Jensen B., Norskov L., Thim L. y Menger U. (1990). A serine protease triad forms the catalytic centre of a triacylglycerol lipase. *Nature*, 343, 767-770.

Referencias

- Brzozowski A. M., Derewenda U., Derewenda Z. S., Dodson G. G., Lawson D. M., Turkenburg J. P., Bjorkling F., Huge-Jensen B., Patkar S. A. y Thim L. (1991). A model for interfacial activation in lipases from the structure of a fungal lipase-inhibitor complex. *Nature*, 351, 491– 494.
- Buchgraber M., Ulberth F. y Anklam E. (2004). Interlaboratory evaluation of injection techniques for triglyceride analysis of cocoa butter by capillary gas chromatography. *Journal of Chromatography A*, 1036, 197-203.
- Cambillau C., Longhi S., Nicolas A. y Martinez C. (1996). Acyl glycerol hydrolases: inhibitors, interface and catalysis. *Current opinion in structural biology*, 6, 449-455.
- Carelli A. y Cert. A. (1993). Comparative study of the determination of triacylglycerol in vegetable oils using chromatographic technique. *Journal of Chromatography*, 630, 213-222.
- Carelli A., Ceci L. y Crapiste G. (2002). Phosphorus-to-phospholipid conversion factors for crude and degummed sunflower oils. *Journal of the American Oil Chemists' Society*, 79 (12), 1177-1180.
- Chang Y. S., Sang H. L., Choi K. H., y Kwon S. H. B. (1996).Rapid analysis of lysophosphatidic acid and lysophosphatidyl choline in human samples by fast atom bombardment tandem mass spectrometry. *Korean Chemical Society*, 17, 575-577.
- Chattopadhyay S., Sivalingam G. y Madras G. (2003). Lipase specificity for the hydrolysis of poly (vinil acetate). *Polymer Degradation and Stability*, 80, 477-483.
- Christian G. D. (1994). Analytical chemistry. Capítulo siete. Quinta edición. Wiley, New York.
- Christie W. W., Nikolova-Damyanova B., Laakso P. y Herslöf B. (1991). Stereospecific analysis of triacyl-*sn*-glycerols via resolution of diastereomeric diacylglycerol derivatives by high-performance liquid chromatography on silica. *Journal of the American Oil Chemists' Society*, 68 (10), 695-701.

Referencias

- Colbert L. B. (1998). Lecithins tailored to your emulsification needs. American Association of Cereal Chemists, 43 (9) 686-688.
- Crooks G. E., Rees G. D., Robinson B. H., Svensson M. y Stepheson G. R. (1995). Comparison of hydrolysis and esterification behaviour of *Humicola lanuginosa* and *Rhizomucor miehei* lipases in AOT-stabilized water-in-oil microemulsions: I. Effect of pH and water content on reaction kinetics. Biotechnology and Bioengineering, 48, 78-88.
- Cygler M., Grochulski P., Kazlauskas R. J., Schrag J. D., Bouthillier F., Rubin B., Serreqi A. N., y Gupta A. K. (1994). Journal of the American Oil Chemists' Society, 116, 3180-3186.
- Dashiell G. L. (2001). Fuentes, métodos de proceso y usos comerciales de la lecitina. Procesamiento y formulación de productos terminados-lecitina. A & G 43, Tomo XI, n2, 197-204.
- David F., Sandra P y Wylie P. L. (2002). Improving the analysis of fatty acid methyl esters using retention time locked methods and retention time databases. Agilent Technologies Application Note 5988-5871EN, Palo Alto, CA.
- Day R.A. y Underwood A. L. (1989). Química analítica cuantitativa. Quinta edición. Prentice-Hall – Hispanoamericana, S. A.
- De B. K., Bhattacharyya D. K. y Bandhu C. (1999). Enzymatic synthesis of fatty alcohol esters by alcoholysis. Journal of the American Oil Chemists' Society, 76 (4), 451-453.
- de Caro J, Boudouard M, Bonicel J, Guidoni A, Desnuelle P y Rovery M. (1981). Porcine pancreatic lipase. Completion of the primary structure. Biochimica et Biophysica Acta, 671(2), 129-38.
- Deng H. T., Xu Z. K., Huang X. J., Wu J. y Seta P. (2004). Adsorption and activity of *Candida rugosa* lipase on polypropylene hollow fiber membrane modified with phospholipid analogous polymers. Langmuir 20, 10168-10173.

Referencias

- Derewenda U., Swenson L., Wei Y., Green R., Kobos P. M., Joerger R., Haas M. J., y Derewenda Z. S. (1994). Conformational lability of lipases observed in the absence of an oil-water interface: crystallographic studies of enzymes from the fungi *Humicola lanuginosa* and *Rhizopus delemar*. *Journal of Lipid Research*, 35, 524-534.
- Deuel J. H. (1957). The lipids: their chemistry and biochemistry. Capítulo cinco (1). Tercera edición. Interscience Publishers.
- Dickinson E. (1992). Interfacial interactions and the stability of oil-in-water emulsions. *Pure and Applied Chemistry*, 64 (11), 1721-1724.
- Domínguez de María P., Sánchez-Montero J. M., Sinisterra J. V., Alcántara A. R. (2006). Understanding *Candida rugosa* lipases: An overview (Research review paper). *Biotechnology advances*, 24, 180 – 196.
- Falk Vikbjerg A., Peng L., Mu H. y Xu X. (2005). Continuous production of structured phospholipids in a packed bed reactor with lipase from *Thermomyces lanuginosa*. *Journal of the American Oil Chemists' Society*, 82 (4), 237-242.
- Fernández-Lorente G., Palomo J. M., Fuentes M., Mateo C., Guisán J. M. y Fernández-Lafuente R. (2003). Self-assembly of *Pseudomonas fluorescens* lipase into biomolecular aggregates dramatically affects functional properties. *Biotechnology and Bioengineering*, 82 (2), 232-237.
- Fisher M. y Pleiss J. (2003). The lipase engineering database: a navigation and analysis tool for protein families. *Nucleic Acids Research*, 31 (1), 319-321.
- Foresti M. L. (2006). Estudio de la actividad catalítica de lipasas inmovilizadas en reacciones de esterificación. Tesis de Doctor. Departamento de Ingeniería Química. Universidad Nacional del Sur.
- Foresti M. L. y Ferreira M. L. (2004). A computational approach to solvent-free synthesis of ethyl oleate using *Candida rugosa* and *Candida antarctica* B lipases. I. Interfacial activation and substrate (ethanol, oleic acid) adsorption. *Biomacromolecules*, 5, 2366 – 2375.

Referencias

- Foresti M. L. y Ferreira M. L. (2005). Frequent analytical/experimental problems in lipase-mediated synthesis in solvent free systems and how to avoid them. *Analytical and Bioanalytical Chemistry*, 381 1408–1425.
- Freeman, I. P. y Morton I. D. (1996). Acyl migration in diacylglycerols. *Journal of the American Oil Chemists' Society* (C), 1710-1711.
- Frizzera L. M. (2002). Caracterización de ceras en aceite de girasol. Tesis de Magíster en Química. Departamento de Química. Universidad Nacional del Sur.
- Fu X., Zhu X., Gao K. y Duan J. (1995). Oil and fat hydrolysis with lipase from *Aspergillus sp.* *Journal of the American Oil Chemists' Society*, 72 (5), 527-531.
- Fureby A. M. (1995). Aspects on lipase-catalyzed preparation of partial acylglycerols. Ph. D. Thesis. Lund University.
- Fureby A. M., Virtö C., Adlercreutz P. y Mattiason B. (1996). Acyl group migration in 2-monoolein. *Biocatalysis Biotransformation*, 14, 89-111.
- Gandhi N. N. (1997). Applications of lipase - Review. *Journal of the American Oil Chemists' Society*, 74 (6), 621-634.
- García H. S., Malcata F. X., Hill C. G. J. y Amundson C. H. (1992). Use of *Candida rugosa* lipase immobilized in a spiral wound membrane reactor for the hydrolysis of milkfat. *Enzyme and Microbial Technology*, 14, 535-545.
- Garner C. W. Jr y Smith L. C. (1972). Porcine pancreatic lipase a glycoprotein. *The Journal of Biological Chemistry*, 247 (2), 561-565.
- Giorno L., Molinari R. y Drioli E. (1996). Experimental studies on enzyme membrane reactors in oil treatment. Advances in oils and fats, antioxidants and oils seed by-products. Proceedings of the world conference on oilseed and edible oils processing, vol II, 91-94.
- Grabuleda X., Jaime C. y Guerrero A. (1997). Estimation of the lipase PS (*Pseudomonas cepacia*) active site dimensions based on molecular mechanics calculations. *Tetrahedron: Asymmetry*, 8 (21), 3675-3683.

Referencias

- Grochulski P., Li Y., Schrag J. D. y Cygler M. (1994). Two conformational states of *Candida rugosa* lipase. *Protein Science*, 3(1), 82-91.
- Grochulski P., Li Y., Schrag J. D., Bouthillier F., Smith P., Harrison D., Rubin B. y Cygler M. (1993). Insights into interfacial activation from an open structure of *Candida rugosa* lipase. *Journal of Biological Chemistry*, 268, 12843-12847.
- Guieysse D., Salagnad C., Monsan P., Remaud-Simeon M., Tran V. (2003). Towards a novel explanation of *Pseudomonas cepacia* lipase enantioselectivity via molecular modelling of the enantiomer trajectory into the active site. *Tetrahedron: Asymmetry*, 14, 1807-1817.
- Gunstone F. D. (1999). Enzymes as biocatalysts in the modification of natural lipids – Review. *Journal of the Science of Food and Agriculture*, 79, 1535-1549.
- Gutiérrez Ayesta C., Carelli A. y Ferreira M. L. (2007). Relation between lipase structures and their catalytic ability to hydrolyse triglycerides and phospholipids. *Enzyme and Microbial Technology*, 41, 35-43.
- Haas M. J. y Scott K. M. (1996). Diesel fuel as a solvent for the lipase-catalyzed alcoholysis of triglycerides and phosphatidylcholine. *Journal of the American Oil Chemists' Society*, 73 (11), 1497-1503.
- Haas M. J., Cichowicz D. J., Jun W. y Scott K. (1995). The enzymatic hydrolysis of triglyceride-phospholipid mixtures in an organic solvent. *Journal of the American Oil Chemists' Society*, 72 (5) 519-525.
- Haas M. J., Cichowicz D. J., Phillips J. y Moreau R. (1993). The hydrolysis of phosphatidylcholine by an immobilized lipase: optimization of hydrolysis in organic solvents. *Journal of the American Oil Chemists' Society*, 70 (2), 111-117.
- Haas M. J., Scott K., Jun W. y Janssen G. (1994). Enzymatic phosphatidylcholine hydrolysis in organic solvents: an examination of selected commercially available lipases. *Journal of the American Oil Chemists' Society*, 71 (5) 483-490.

Referencias

- Hara F, Nakashima T y Fukuda H. (1997). Comparative study of commercially available lipases in hydrolysis reaction of phosphatidylcholine. *Journal of the American Oil Chemists' Society*, 74 (9), 1129–1132.
- Harwood H. J., Thomas III A. E., Scharoun J. E., Slutkin R. (1963). Composition of the equilibrium mixture of 1,2- and 1,3-diestearin. *Chemical Industries*, 4, 651.
- Hjorth A., Carriere F., Cudrey C., Woldike H., Boel E., Lawson D. M., Ferrato F., Cambillau C., Dodson G. G., Thim L. y Verger R. (1993). A structural domain (the lid) found in pancreatic lipases is absent in the guinea pig (phosphor) lipase. *Biochemistry*, 32, 4702 – 4707.
- Holló J., Perédi J., Ruzics A., Jeránek M. y Erdélyi A. (1993). Sunflower lecithin and possibilities for utilization. *Journal of the American Oil Chemists' Society*, 70 (10), 997-1001.
- Holmquist M., Martinelli M., Berglund P., Clausen I. G., Patkar S., Svendsen A. y Hult K. (1993). Lipases from *Rhizomucor miehei* and *Humicola lanuginosa*. Modification of the lid covering the active site alters enantioselectivity. *Journal of Protein Chemistry*, 12, 749-757.
- Holmquist M., Norin M. y Hult K. (1993). The role of arginines in stabilizing the active open-lid conformation of *Rhizomucor miehei* lipase. *Lipids*, 28 (8), 721-726.
- Instituto de la Grasa (1992). Hidrólisis, Esterificación e Interesterificación. Apuntes del curso de capacitación en aceites y grasas. Sevilla.
- IUPAC - International Union of Pure and Applied Chemistry Standard Methods for the Analysis of Oils, Fats and Derivatives. (1992). Séptima edición, C. Paquot and A. Hautgenne (ed.), Blackwell Scientific Publications Inc., Oxford.
- IUPAC-IUB. Commission on Biochemical Nomenclature, Nomenclature of Phosphorus-Containing Compounds of Biochemical Importance. (1977). *European Journal of Biochemistry*, 79, 1-9.

Referencias

- Jaeger K. E. y Eggert T. (2002). Lipases for biotechnology. Current opinion in biotechnology, 13, 390-397.
- Jaeger K. E. y Reetz M. T. (1998). Microbial lipases from versatile tools for biotechnology. Trends in Biotechnology, 16, 396-403.
- Jing F., An X. y Shen W. (2003). The characteristics of hydrolysis of triolein catalyzed by wheat germ lipase in water-in-oil microemulsions. Journal of Molecular Catalysis B: Enzymatic 24-25, 53-60.
- Kaufman, V. R. y Garti N. (1982). Organic reactions in emulsions - Preparation of glycerol and polyglycerol esters of fatty acids by transesterification reaction. Journal of the American Oil Chemists' Society, 59, 471-474.
- Khan I. M., Chandan R. C. y Shahani K. M. (1975). Bovine pancreatic lipase. II. Stability and effect of activators and inhibitors. Journal of Dairy Science, 59 (5) 840-846.
- Kim K. K., Song H. K., Shin D. H., Hwang K. Y., Suh S. W. (1997). The crystal structure of a triacylglycerol lipase from *Pseudomonas cepacia* reveals a highly open conformation in the absence of a bound inhibitor. Structure, 5, 173-185.
- Kim K. R., Kwon D. Y., Yoon S. H., Kim W. Y., Kim K. H. (2005). Purification, refolding, and characterization of recombinant *Pseudomonas fluorescens* lipase. Protein Expression and Purification, 39, 124-129.
- Kirk O. y Christensen M. W. (2002). Lipases from *Candida antarctica*: unique biocatalysts from a unique origin. Organic Process Research & Development, 6, 446-451.
- Kirk-Othmer. (1995). Encyclopedia of chemical technology. Cuarta edición. John Wiley & Sons.
- Klibanov A. M. (1997). Why are enzymes less active in organic solvents than in water?.Trends in Biotechnology, 15, 97-101.

Referencias

- Knezevic Z., Bobic S., Milutinovic A., Obradovic B., Mojovic L. y Bugarski B. (2002). Alginate-immobilized lipase by electrostatic extrusion for the purpose of palm oil hydrolysis in lecithin/isooctane system. *Process Biochemistry*, 38, 313-318.
- Koris A. y Vatai G. (2002). Dry degumming of vegetable oils by membrane filtration. *Desalination*, 148, 149-153.
- Krawczyk T. (1996). Lecithin: consider the possibilities. *Inform*, 7 (11), 158-1167.
- Legier V., Del Guist C., Comeau L. (1994). Sur quelques essais d'hydrolyse enzymatique d'huile altérée. *Revue française des corps gras*, 41 (3-4), 45-52.
- Lehninger A. L. (1975). *Biochemistry - The molecular basis of cell structure and function*. Segunda edición. Worth Publishers, Inc.
- List G. R., Avellaneda J. M. y Mounts T. L. (2001). Efectos de las condiciones del desgomado en la extracción y la calidad de la lecitina de soja. *Procesamiento y formulación de productos terminados-lecitina*. A&G 43, Tomo XI, Nº2, 207-218.
- Lowe M. E. (1992). The catalytic site residues and interfacial binding of human pancreatic lipase. *The Journal of Biological Chemistry*, 267 (24), 17069-17073.
- Luddy F. E., Barford R. A., Herb S. F., Magidman P. y Riemenschneider R. W. (1964). Pancreatic lipase hydrolysis of triglycerides by semimicro technique. *Journal of the American Oil Chemists' Society*, 41, 693-696.
- Machado M. S., Pérez-Pariente J., Sastre E., Cardoso D., de Guereñu A. M. 2000). Selective synthesis of glycerol monolaurate with zeolitic molecular sieves. *Applied Catalysis A: General*, 203, 321-328.
- Mancheño J. M., Pernas M. A., Martínez M. J., Ochoa B., Rúa M. L. y Hermoso J. A. (2003). Structural insights into the lipase/esterase behavior in the *Candida rugosa* lipases family: crystal structure of the lipase 2 isoenzyme at 1.97 Å - Resolution. *Journal of Molecular Biology*, 332, 1059-1069.

Referencias

- Marcato B. y Cecchin G. (1996). Analysis of mixtures containing free fatty acids and mono-, di- and triglycerides by high-performance liquid chromatography coupled with evaporative light-scattering detection. *Journal of Chromatography A*, 730, 83-90.
- Marchis-Mouren G., Sarda L. y Desnuelle P. (1959). Purification of hog pancreatic lipase. *Archives of Biochemistry and Biophysics*, 83, 1, 309-319.
- McNair H. M. (1981). Cromatografía de gases. Secretaría General de la Organización de los Estados Americanos. Programa Regional de Desarrollo Científico y Tecnológico.
- Metzger J. O. (1998). Solvent-free organic syntheses. *Angewandte Chemie International Edition*, 37, 21 2975-2978.
- Miller D. A., Blanch H. W. y Prausnitz J. M. (1991) .Enzyme-catalyzed interesterification of triglycerides in supercritical carbon dioxide. *Industrial and Engineering Chemistry Research*, 30 (5), 939-946.
- Minovska V., Winkelhausen E. y Kuzmanova S. (2005). Lipase immobilized by different techniques on various support materials applied in oil hydrolysis. *Journal of Serbian Chemical Society*, 70 (4), 609-624.
- Mogi K., Nakajima M. y Mukataka S. (1999). Surfactant modification of lipases for lipid interesterification and hydrolysis reactions. *Journal of the American Oil Chemists' Society*, Vol. 76, no. 11 P 1259-1264
- Morgado M. A. P., J. M. S. Cabral, y D. M. F. (1996). Prazeres Phospholipase A₂-catalyzed hydrolysis of lecithin in a continuous reversed-micellar membrane bioreactor. *Journal of the American Oil Chemists' Society*, 73 (3), 337-346.
- Mu H., Kalo P., Xu X., Hoy C. E. (2000). Cromatographic methods in the monitoring of lipase-catalyzed interesterification. *European Journal of Lipid Science Technology*, 102 (3), 202-211.

Referencias

- Mustranta A., Forsell P., Pountanen, K. (1995). Comparison of lipases and phospholipases in the hydrolysis of phospholipids. *Process Biochemistry*, 30, 393-401.
- Neves Petersen M. T., Fojan P., Petersen S. B. (2001). How do lipases and esterases work: the electrostatic contribution. *Journal of Biotechnology*, 85, 115-147.
- Nini L., Sarda L., Comeau L. C., Boitard E., Dubés J. P. y Chahinian H. (2001). Lipase-catalysed hydrolysis of short-chain substrates in solution and in emulsion: a kinetic study. *Biochimica et Biophysica Acta*, 1534, 34-44.
- Norin, M., F. Haeffner, A. Achour, T. Norin y K. Hult. (1994). Computer modeling of substrate binding to lipases from *Rhizomucor miehei*, *Humicola lanuginosa* and *Candida rugosa*. *Protein Science*, 3, 1493- 1503.
- OConnor J, Aggett A., Williams D. R. y Stanley R. A. (1991). *Candida cylindracea* lipase-catalyzed hidrolysis of methyl palmitate in detergentless microemulsion and paraffin/water biphasic media. *Australian Journal of Chemistry*, 44 (1), 53-60.
- Ollis D. L., Cheah E., Cygler M., Dijkstra B., Frolov F., Franken S. M., Harel M., Remington S. J., Silman I., Schrag J., Sussman J. L., Verschueren K. H. G. y Goldman A. (1992). The α / β hydrolase fold. *Protein Engineering*, 5 (3), 197-211.
- Osawa C., Guaraldo Gonçalves L. A., Ragazzi S. y Juárez M. D. (2005). Nuevo método de detección de ácidos grasos libres de grasas y aceites, basado en titulación potenciométrica. *Proceedings del XI Congreso Latinoamericano de Grasas y Aceites*, 137-140.
- Otero C., Pastor E., Fernández V. M. y Ballesteros A. (1990). Influence of the support on the reaction course of tributyrin hydrolysis catalyzed by soluble and immobilized lipases. *Applied Biochemistry and Biotechnology*, 23, 237-247.
- Ottosson J., Fransson L. Y Hult K. (2002). Substrate entropy in enzyme enantioselectivity: An experimental and molecular modelling study of a lipase. *Protein Science*, 11, 1462-1471.

Referencias

- Paiva A. L., Balcão V. M. y Malcata F. X. (2000). Kinetics and mechanisms of reaction catalyzed by immobilized lipase. *Enzyme and Microbial Technology*, 27 187-204.
- Pan L. G., Puppo M. C., Ferrero C., Tomás M. C. y Añón M. C. (2005). Efecto del agregado de lecitina de girasol sobre el pan francés. *Proceedings del XI Congreso Latinoamericano de Grasas y Aceites*, 205-207.
- Pan L.G., Buedo A., Tomás M. C., Calvelo A. y Añón M. C. (2003). Obtención, acondicionamiento y caracterización de lecitinas de girasol. ASAGIR (Asociación Argentina del Girasol). Murales del Segundo Congreso Argentino de Girasol.
- Pardum (1979). Die Entsäuerung von Pflanzenölen mit Ammoniak Eine umweltfreundliche Raffinationsmethode. *Fette, Seifen, Anstrichmittel*, 81 (8), 297-302.
- Parnham M. J. (2001). La importancia de las especificaciones terminológicas en los fosfolípidos. Procesamiento y formulación de productos terminados-lecitina. *Aceites & Grasas*, 43, Tomo XI, Nº2, 219-225.
- Penci M. C. (2009). Modificación enzimática de lecitinas. Tesis de Doctor. Departamento de Ingeniería Química. Universidad Nacional del Sur.
- Penci, M. C., Constenla D., Carelli A. A. (2005). Análisis comparativo de hidrólisis enzimática en lecitinas de soja y girasol. *Proceedings del XI Congreso Latinoamericano de Grasas y Aceites*, 54-56.
- Peng L., Xu X., Mu H., HØy C. E. y Adler-Nissen J. (2002). Production of structured phospholipids by lipase-catalyzed acidolysis: optimization using response surface methodology. *Enzyme and Microbial Technology*, 31, 523-532.
- Pérez-Camino M. C., Moreda W. y Cert A. (1996). Determination of diacylglycerol isomers in vegetable oils by solid-phase extraction followed by gas chromatography on a polar phase. *Journal of Chromatography A*, 721, 305-314.

Referencias

- Petersen, S. B., Jonson, P. H., Fojan, P., Petersen, E. I., Petersen, M.T.N., Hansed, S., Ishak, R.J. y Hough, E. (1998). Protein engineering the surface of enzymes. *Journal of Biotechnology*, 66 (1), 11-26.
- Petkar M., Lali A., Caimi P. y Daminati M. (2006). Immobilization of lipases for non-aqueous synthesis. *Journal of Molecular Catalysis B: Enzymatic*, 39, 83-90.
- Piyatheerawong W., Iwasaki Y., Xu X. y Yamane T. (2004). Dependency of water concentration on ethanolysis of trioleylglycerol by lipases. *Journal of Molecular Catalysis B: Enzymatic*, 28, 19-24.
- Plank C. y Lorbeer E. (1995). Simultaneous determination of glycerol, and mono-, di-, and triglycerides in vegetable oil methyl esters by capillary gas chromatography. *Journal of Chromatography A*, 697, 461-468.
- Pleiss J., Fischer M. y Schmid R. D. (1998). Anatomy of lipase binding sites: the scissile fatty acid binding site. *Chemistry and Physics of Lipids*, 93, 67- 80.
- Pleiss J., Fischer M., Peiker M., Thiele C. y Schmid R. D. (2000). Lipase engineering database. Understanding and exploiting sequence-structure-function relationships. *Journal of Molecular Catalysis B: Enzymatic*, 10, 491-508.
- Plou F. J., Barandiarán M., Calvo M. V., Ballesteros A. y Pastor E. (1996). High-yield production of mono- and di-oleylglycerol by lipase-catalyzed hydrolysis of triolein. *Enzyme and Microbial Technology*, 18, 66-71.
- Plummer T. H. Jr y Sarda L. (1973). Isolation and characterization of the glycopeptides of porcine pancreatic lipases L_A and L_B. *The Journal of Biological Chemistry*, 248 (22), 7865-7869.
- Pouilloux Y., Abro S., Vanhove C. y Barrault J. (1999). Reaction of glycerol with fatty acids in the presence of ion-exchange resins. *Journal of Molecular Catalysis A: Chemical*, 149, 243-254.

Referencias

- Quinlan, P. T y Moore, S. (1993). Modification of triglycerides by lipases: process technology and its application to the production of nutritionally improved fats. *Inform*, 4 (5) 580-585.
- Raviwan Tinoi M. S. (1999). Isolation of erucic acid from mustard seed oil by *Candida rugosa* lipase. Ph D Thesis in Biotechnology.
- Raza S., Fransson L. y Hult K. (2001). Enantioselectivity in *Candida antarctica* lipase B: A molecular dynamics study. *Protein Science*, 10 (2), 329-338.
- Reetz M. T. (2002). Lipases as practical biocatalysts. *Current Opinion in Chemical Biology*, 6, 145-150.
- Reis P., Holmberg K., Watzke H., Leser M. E. y Miller R. (2009). Lipases at interfaces: A review. *Advances in Colloid and Interface Science*, 147-148, 237-250.
- Reis P., Miller R., Kragel J., Leser M. E., Fainerman V. B., Watzke H. y Holmberg K. (2008a). Lipases at interfaces: Unique interfacial properties as globular proteins. *Langmuir*, 24, 6812-6819.
- Reis P., Miller R., Leser M. E., Watzke H., Fainerman V. B., y Holmberg K. (2008b). Adsorption of polar lipids at the water-oil interface. *Langmuir*, 24, 5781-5786.
- Rogalska E., Cudrey C., Ferrato F. y Verger R. (1993). Stereoselective hydrolysis of triglycerides by animal and microbial lipases. *Chirality*, 5, 24-30.
- Salis A., Svensson I., Monduzzi M., Solinas V. y Adlercreutz P. (2003). The atypical lipase B from *Candida antarctica* is better adapted for organic media than the typical lipase from *Thermomyces lanuginosa*. *Biochimica et Biophysica Acta*, 1646, 145-151.
- Saxena R. K., Ghosh P. K., Gupta R., Davidson W. S., Bradoo S. y Gulati R. (1999). Microbial lipases: potential biocatalysts for the future industry. *Current Science*, 77 (1) 101-115.

Referencias

- Schmidt-Dannert C., Pleiss J., y Schmid R. D. (1998). A toolbox of recombinant lipases for industrial applications. *Annals of the New York Academy of Sciences. Enzyme Engineering XIV* (864), 14-22.
- Schmitt J., Brocca S., Schmid R. D. y Pleiss J. (2002). Blocking the tunnel: engineering of *Candida rugosa* lipase mutants with short chain length specificity. *Protein Engineering*, 15 (7), 595-601.
- Schrag J. D., Li Y., Cygler M., Lang D., Burgdorf T., Hecht H. J., Schmid R., Schomburg D., Rydel T. J., Oliver J. D., Strickland L. C., Dunaway C. M., Larson S. B., Day J. y McPherson A. (1997). The open conformation of a *Pseudomonas* lipase. *Structure*, 5, 187-202.
- Servagent-Noiville S., Revault M., Baron M-H, Ivanova M., Tiss A., Yapoudjan S., Svendsen A., y Verger R. (2002). Conformational changes and orientation of *Humicola lanuginosa* lipase on a solid hydrophobic surface: an in-situ intergace Fournier transform infrared-attenuated total relection study. *Biophysical Journal*, 82, 2709-2719.
- Sharma R., Chisti Y. y Banerjee U. C.. (2001). Production, purification, characterization, and applications of lipases - Research review paper. *Biotechnology Advances*, 19, 627- 662.
- Sinram R. D. y Meyer L. (1996). El valor agregado de las lecitinas para uso en especialidades. Aceites Vegetales-Subproductos. Aceites y Grasas.
- Skoog D. A. y Leary J. J. (1994). Análisis instrumental. Cuarta edición. McGraw-Hill/ Interamericana de España, S.A.
- Skoog D. A., West D. M. y Holler F. J. (1997). Química analítica. Sexta edición. Colombia.
- Sosada M. (1996). Studies on stability of rapeseed wet gum as a source of pharmaceutical lecithin. *Journal of the American Oil Chemists' Society*, 73 (3), 367-370.

Referencias

- Stobiecka A., Wysocki S., Brzozowski A. M. (1998). Fluorescence study of fungal lipase from *Humicola lanuginosa*. *Journal of Photochemistry and Photobiology B: Biology*, 45, 95-102.
- Sugiura M., Oikawa T., Hirano K. y Inukai T. (1977). Purification, crystallization and properties of triacylglycerol lipase from *Pseudomonas fluorescens*. *Biochimica et Biophysica Acta. Lipids and Lipid Metabolism*, 488 (3), 353-358.
- Sugiura M. y Oikawa T. (1977). Physicochemical properties of a lipase from *Pseudomonas fluorescens*. *Biochimica et Biophysica Acta. Lipids and Lipid Metabolism*, 489 (2), 262-268.
- Szuhaj B. F. (1989). Lecithins: sources, manufacture & uses. The American Oil Chemist's Society. Champaign Illinois. Capítulo tres, 16-31; Capítulo siete, 109-130; Capítulo nueve, 145-161 y Capítulo diez, 162-173.
- Tafi A, Manetti F., Botta M., Casati S. y Santaniello E. (2004). A drop of enantioselectivity in the *Pseudomonas cepacia* lipase-catalyzed ester hydrolysis is influenced by the chain length of the fatty acid. *Tetrahedron: Asymmetry*, 15, 2345-2350.
- Tan T. y Yin C. (2005). The mechanism and kinetic model for glycerolysis by 1,3 position specific lipase from *Rhizopus arrhizus*. *Biochemical Engineering Journal*, 25, 39-45.
- Temelli F. y Dunford N. T. (1995). Modification of crude canola lecithin for food use. *Journal of Food Science*, 60 (1), 160-163.
- Thorleif A., D'Arrigo P., Pedrocchi-Fantoni G., Secundo F., Servi S., Sundby E. (1999). Phospholipids hydrolysis in organic solvents catalysed by immobilised phospholipase C. *Journal of Molecular Catalysis B: Enzymatic*, 6, 125-132.
- Uppenberg J., Hansen M.T., Patkar S. y Jones T. A. (1994). The sequence, crystal structure determination and refinement of two crystal forms of lipase B from *Candida antarctica*. *Structure*, 2 (4), 293-308.

Referencias

- Valenzuela A y Nieto S. (1994). Biotechnology of lipids: the use of lipases for the structural modification of fats and oils. *Grasas y Aceites*, 45 (5), 337-343.
- van Nieuwenhuyzen. W. (1999). Fractionation of lecithins. *Process Technology*, The European food & drink reviewer, 27-32.
- Vandana V., Karuna M. S. L., Vijayalakshmi P., y Prasad R. B. N. (2001). A simple method to enrich phospholipid content in commercial soybean lecithin. *Journal of the American Oil Chemists' Society*, 78 (5), 555-556.
- Vázquez Lima F., Pyle D. L., Asenjo J. A. (1995). Factors affecting the esterification of lauric acid using an immobilized biocatalyst: Enzyme characterization and studies in a well-mixed reactor. *Biotechnology and Bioengineering*, 46 (1), 69-79.
- Verger R. (1997)."Interfacial activation" of lipases: facts and artefacts. *Trends Biotechnol*, 15, 32-38.
- Verger R., Mieras M. C. E. y de Haas G. H. (1973). Action of phospholipase A at interfaces. *Journal of Biological Chemistry*, 248 (11), 4023-4034.
- Vikbjerg A. F., Mu H. y Xu X. (2005). Parameters affecting incorporation and by-product formation during the production of structured phospholipids by lipase-catalyzed acidolysis in solvent-free system. *Journal of Molecular Catalysis B: Enzymatic*, 36, 14-21.
- Villeneuve P., Muderwha J., Graille J. y Haas M. (2000). Customizing lipases for biocatalysis: a survey of chemical, physical and molecular biological approaches – Review. *Journal of Molecular Catalysis B: Enzymatic*, 9, 113-148.
- Vulfson, E. N. (1994). Industrial applications of lipases. In: *Lipases; Structure Biochemistry, Applications*. (P.Wooley, ed) Cambridge University Press, 271-288.
- Watanabe Y., Shimada Y., Sugihara A. y Tominaga Y. (2002). Conversion of degummed soybean oil to biodiesel fuel with immobilized *Candida antarctica* lipase. *Journal of Molecular Catalysis B: Enzymatic*, 17 (3-5), 151-155.

Referencias

- Watts J. F. (2005). The interfacial chemistry of adhesion: novel routes to the holy grail. *Adhesion. Current Research and Application*, 1-16.
- Xu X. (2008). Enzymatic production of structured lipids: process reactions and acyl migration. *Inform*, 11, 1121-1130.
- Xu X., Porsgaard T., Zhang H., Adler-Nissen J., y Hoy C. E. (2002). Production of structured lipids in a packed-bed reactor with *Thermomyces lanuginosa* lipase. *Journal of the American Oil Chemists' Society*, 79 (6), 561-565.
- Xu X., Skands A. R. H., Hoy C. E., Mu H., Balchen S., y Adler-Nissen J. (1998). Production of specific-structured lipids by enzymatic interesterification: elucidation of acyl migration by response surface design. *Journal of the American Oil Chemists' Society*, 75 (9), 1179-1186.
- Yamane T. (1987). Enzyme technology for the lipids industry: an engineering overview. *Journal of the American Oil Chemists' Society*, 64 (12), 1657-1662.
- Yang B., Wang Y. H. y Yang J. G. (2006). Optimization of enzymatic degumming process for rapeseed oil. *Journal of the American Oil Chemists' Society*, 83 (7), 653 – 658.
- Yang T., Fruekilde M. B. y Xu X. (2005). Suppression of acyl migration in enzymatic production of structures lipids through temperature programming. *Food Chemistry*, 92, 101-107.
- Yon C. y Han J. S. (2000). Analysis of trimethylsilyl derivatization products of phosphatidylethanol by gas chromatography-mass spectrometry. *Experimental and molecular medicine*, 32 (4), 243-245.
- Zakz A. y Klibanov A. M. (1985). Enzyme-catalyzed processes in organic solvents. *Proceedings of the National Academy of Science, USA, Biochemistry* 82, 3192-3196.
- Zhang H., Xu X., Nilsson J., Mu H., Adler-Nissen J. y Hoy C. E. (2001). Production of margarine fats by enzymatic interesterification with silica-

Referencias

granulated *Thermomyces lanuginosa* lipase in a large-scale study. Journal of the American Oil Chemists' Society, 78 (1), 57-64.

Ziegelitz R. y Meyer L. (1995). Lecithin processing possibilities. Inform, 6 (11), 1224-1230.

Sitios web:

AE Internacional.

<http://www.americaeconomica.com>. Último acceso: febrero 2010.

Amano Enzyme Inc.

<http://www.amano-enzyme.co.jp>. Último acceso: marzo 2009.

Asociación Argentina de Girasol.

<http://www.asagir.org.ar>. Último acceso: agosto 2009.

Asociación Argentina de Grasas y Aceites.

<http://www.asaga.org.ar>. Último acceso: febrero 2010.

Asociación Argentina de Ingenieros Químicos.

<http://www.aaiq.org.ar>. Último acceso: julio 2009.

ASTM International Standards Worldwide.

<http://www.astm.org/>. Último acceso: enero 2009.

Austrade, Inc. Natural Food & Specialty Ingredients.

<http://www.austradeinc.com>. Último acceso: enero 2010.

Cargill

<http://www.cargilltexturizing.es>. Último acceso: febrero 2010.

Grace Davison.

<http://www.gracedavison.com>. Último acceso: noviembre 2009.

Referencias

International Union of Pure and Applied Chemistry.

<http://www.iupac.org/>. Último acceso: junio 2009.

Novozymes.

<http://www.novozymes.com>. Último acceso: octubre 2009.

Oficina de Investigación de Ciencias Naturales (LSRO).

<http://www.lsro.org/home.html> Último acceso: junio 2009.

Pontificia Universidad Católica de Chile.

<http://www.puc.cl>. Último acceso: abril 2009.

Resindion S.R.L.

<http://www.resindion.com>. Último acceso: agosto 2009.

Restek Chromatography Products.

<http://www.restekcorp.com>. Último acceso: enero 2009.

Revista Producción.

<http://www.produccion.com.ar>. Último acceso: febrero 2010.

Secretaría de Agricultura, Ganadería, Pesca y Alimentación.

<http://www.sagpya.gov.ar>. Último acceso: febrero 2010.

Sigma – Aldrich.

<http://sigmaaldrich.com>. Último acceso: marzo 2009.

The International Lecithin & Phospholipid Society Webside.

http://www.ilps.org/ilps_main.htm. Último acceso: febrero 2009.