CAPÍTULO 7.

BIBLIOGRAFÍA

- Adams, C.E., Ford, D.L. y Eckenfelder, W.W., 1981. *Development of Design and Operational Criteria for Wastewater Treatment.* CBI Publishing Co., Boston.
- Afandizadeh, S. y Foumeny, E.A., 2001. *Design of packed bed reactors: guides to catalyst shape, size and loading selection.* Applied Thermal Engineering, 21, 669-682.
- Alcan Chemicals, 2000. *Product Data. Activated Aluminas.*
- Alonso, A. y Pantelides, C.C., 1996. *Modelling and simulated of integrated membrane process for recovery of Cr(VI) with Aliquat 336.* Journal of Membrane Science, 110, 141-167.
- Alvarez, R., Bueno, J.L. y Andrés, L.J., 1982. *Coeficientes de difusión molecular en fase líquida. I. Ecuaciones de predicción y de correlación en sistemas binarios.* Ingeniería Química, Enero, 137-155.
- APME, 2000. *LCA Reports. Basic Chemicals. Styrene Data Summary.* Association of Plastics Manufacturers in Europe. http://www.apme.org (visitada 20/11/2001).
- Applied Analytics, Inc., 1995. *TBC a Polymerization Inhibitor by a UV Absorbance Method*. Application Note, http://a-a-inc.com (visitada 26/11/2001).
- ASTM, 1995. *D 5135-95. Standard Test Method for Analysis of Styrene by Capillary Gas Chromatography.* American Society for Testing and Materials.
- ASTM, 1995. *D 4590-95a. Standard Test Method for Colorimetric Determination of p-tert-Buthylcatechol in Styrene Monomer or AMS (α-Methylstyrene) by Spectrophotometry.* American Society for Testing and Materials.
- ASTM, 2000. *E 1064-00. Standard Test Method for Water in Organic Liquids by Coulometric Karl Fisher Titration.* American Society for Testing and Materials.
- ASTM, 2000. *Specification D 2827-00. Standard Specification for Styrene Monomer.* American Society for Testing and Materials.

- Axens, 2001. *Activated Alumina & Molecular Sieves. Quality and Advanced Technology.* IFP Group Technologies. http://www.procatalyse.com/axens_ad.pdf (visitada 26/11/2001).

- Balzli, M.W., Liapis, A.I. y Rippin, D.W.T., 1978. *Aplications of mathematical modelling to the simulation of multicomponent adsorption in activated carbon columns.* Transactions of the Institution of Chemical Engineers, 56, 145-156.

- Barton, P. y Pantelides, C.C., 1994. *Modeling of combined discrete/continuous processes.* AIChE Journal, 40 (6), 966-979.

- Basmadjian, D., 1984. *The adsorption drying of gases and liquids.* Advances in Drying, 3, 307-357.

- Beek, W.J. y Muttzall, M.K., 1975. *Transport Phenomena.* John Wiley and sons, London.

- Billmeyer, F.W., 1975. *Ciencia de los Polímeros.* Reverté, D.L., Barcelona.

- Bingpei, H. y Penlidis, A., 1991. *Behaviour of inhibitors in emulsion polymerization (I). Case II. Kinetics.* Journal of Chemical Industry and Engineering (China), 6 (1), 12-20.

- Bisio, A. y Kabel, R.L., 1985. *Scaleup of Chemical Processes.* John Wiley and sons, New York.

- Bouanga, F., De Laat, J. y Dore, M., 1986. *Mode d'elimination de composes organiques polaires par une alumine activée γ-Al_2O_3 en milieux aqueux. Comparison avec le charbon actif.* Environmental Technology Letters, 7 (4), 239-254.

- Box, G.E., Hunter, W.G. y Hunter, J.S., 1988. *Estadística para Investigadores. Introducción al Diseño de Experimentos, Análisis de Datos y Construcción de Modelos.* Reverté, Barcelona.

- Brunauer, S., Emmet, P.H. y Teller, E., 1938. *Adsorption of gases in multimolecular layers.* Journal of American Chemical Society, 60, 309.

- Brüschke, H.E.A. y Tusel, G.F., 1986. *Economics of industrial pervaporation processes.* Proc. Conf. Membranes and Membrane Processes, 581-586.

- Brusis, D., Frey, T., Stichlmair, J., Wagner, I., Duessel, R. y Kuppinger, F.F., 2000. *MINLP Optimization of several process structures for the separation of azeotropic ternary mixtures.* European Symposium on Computer Aided Process Engineering-10. S. Pierucci ed., 109-120.

- Burfield, D.R., Hefter, G.T. y Koh, D.SP., 1984. *Desiccant efficiency in solvent and reagent drying. 8. Molecular sieve column drying of 95% ethanol: an application of hygrometry to the assay of solvent water content.* Journal of Chemical Technology and Biotechnology, 34 (A), 187-194.

- Burfield, D.R., Lee, K.H. y Smithers, R.H., 1977. *Desiccant efficiency in solvent drying. A reappraisal by application of a novel method for solvent water assay.* Journal of Organic Chemistry, 42 (18), 3060-3065.

- Burfield, D.R. y Smithers, R.H., 1982. *Drying of grossly wet ether estracts.* Journal of Chemical Education, 59 (8), 703-704.

- Burfield, D.R. y Smithers, R.H., 1983. *Desiccant efficiency in solvent and reagent drying. 7. Alcohols.* Journal of Organic Chemistry, 48, 2420-2422.

- Burfield, D.R., Smithers, R.H. y Tan, A.S.C., 1981. *Desiccant efficiency in solvent and reagent drying. 5. Amines.* Journal of Organic Chemistry, 46, 629-631.

- Burshe, M.C., Netke, S.A., Sawant, S.B., Joshi, J.B. y Pangarkar, V.G., 1997. *Pervaporative dehydration of organic solvents.* Separation Science and Technology, 32 (8), 1335-1349.

- Calleja, G. , García, F., de Lucas, A., Prats, D. y Rodriguez, J.M., 1999. *Introducción a la Ingeniería Química*. Síntesis, Madrid.

- Carter, J.W., 1966. *A numerical method for prediction of adiabatic adsorption in fixed beds.* Transactions of the Institution of Chemical Engineers, 44, T253-T259.

- Carter, J.W., 1968. *Isothermal and adiabatic adsorption in fixed beds.* Transactions of the Institution of Chemical Engineers, 46, T213-T222.

- Carter, J.W. y Barrett, D.J., 1973. *Comparative study for fixed bed adsorption of water vapour by activated alumina, silica gel and molecular sieve adsorbents.* Transactions of the Institution of Chemical Engineers, 51, 75-81.

- Carter, J.W. y Husain, H., 1974. *The simultaneous adsorption of carbon dioxide and water vapour by fixed beds of molecular sieves.* Chemical Engineers Science, 29, 267-273.

- Chaer, M.A., 1999. *Computer simulations of the adsorption process of light alkanes in high-silica zeolites.* Journal of Molecular Structure (Theochem), 464, 239-247.

- Chantong, A. y Massoth, F.E., 1983. *Restrictive diffusion in aluminas.* American Institute of Chemical Engineers Journal, 29 (5), 725-731.

- Chapra, S.C. y Canale, R.P., 1999. *Métodos Numéricos para Ingenieros,* 3ª ed., McGraw-Hill, Méjico.

- Chan, W.H., Ng, C.F., Lam, S.Y. y He, L.X., 1999. *Water–alcohol separation by pervaporation through chemically modified poly(amidesulfonamide)s.* Journal of Membrane Science, 160 (1), 77-86.

- Chen, J.R., Hsiung, G.Y., Hsu, Y.J., Chang, S.H., Chen, C.H., Lee, W.S., Ku, J.Y., Chan, C.K., Joung, L.W. y Chou, W.T., 2001. *Water adsorption-desorption on aluminum surface.* Applied Surface Science, 169-170, 679-684.

- Chen, X., Li, W., Shao, Z., Zhong, W. y Yu, T., 1999. *Separation of alcohol-water mixture by pervaporation through a novel natural polymer blend membrane chitosan/silk fibroin blend membrane.* Journal of Applied Polymer Science, 73 (6), 975-980.

- Chen, A., Snoeyink, V.L. y Mallevialle, J., 1989*. Activated alumina for removing dissolved organic compounds.* American Water Works Association, 81 (1), 53-60.

- Chin, K., 1999. *Making the most of your plant.* Chemical Engineering, 106 (3), 139.

- Cooney, D.O., 1990. *Rapid approximate solutions for adsorption bed concentration profile and breakthrough curve behaviour: favorable isotherms and both phase resistances important.* Chemical Engineering Communications, 91, 1-9.

- Coulson J.M. y Richardson, J.F., 1991. *Chemical Engineering*, 4th ed., vol. 2. Pergamon Press, Oxford.

- Crank, J., 1993. *The Mathematics of Diffusion,* 2nd ed., Clarendon Press, Oxford.

- Cunningham, M.F., Geramita, K. y Ma, J.W., 2000. *Measuring the effects of dissolved oxygen in styrene emulsion polymerization.* Polymer, 41, 5385-5392.

- Cussler, E.L., 1997. *Diffusion - Mass Transfer in Fluid Systems,* 2nd ed., Cambridge University Press, Cambrigde, UK.

- Dabrowski, A., 2001. *Adsorption – from theory to practice.* Advances in Colloid and Interface Science, 93, 135-224.

- Daumiller, G., 1968. *Polymerisationsreaktionen in der technik.* Chemie Ingenieur Technik, 40 (14), 673-682.

- Davies, G.M. y Seaton, N.A., 2000. *Predicting adsorption equilibrium using molecular simulation.* AIChE Journal, 46 (9), 1753-1768.

- Derr, R.B. y Willmore, C.B., 1939. *Dehydration of organic liquids with activated alumina.* Industrial and Engineering Chemistry, 31 (7), 866-868.

- Desai, R., Hussain, M. y Ruthven, D.M., 1992a. *Adsorption of water vapour on activated alumina. I. Equilibrium behaviour.* The Canadian Journal of Chemical Engineering, 70, 699-706.

- Desai, R., Hussain, M. y Ruthven, D.M., 1992b. *Adsorption of water vapour on activated alumina. II. Kinetic behaviour.* The Canadian Journal of Chemical Engineering, 70, 707-715.

- Díaz, S. Gros, H. y Brignole, E.A., 2000. *Thermodynamic modeling, synthesis and optimization of extraction-dehydration processes.* Computers and Chemical Engineering, 24, 2069-2080.

- Do, D.D., 1998. *Adsorption Analysis: Equilibria and Kinetics.* Imperial College Press.

- Dutta, B.K., Ji, W. y Sikdar, S.K., 1997. *Pervaporation: Principles and applications.* Separation and Purification Methods, 25 (2), 131-224.

- Dwivedi, P.N. y Upadhyay, S.N., 1977. *Particle-fluid mass transfer in fixed and fluidized beds.* Industrial and Engineering Chemistry Process, Design and Development, 16 (2), 157-165.

- Eagleton, C.M. y Dyer, W., 1967. U.K. Patent 1 055 270.

- Eaves, D.E. y Sewell, P.R., 1964. *Drying liquid hydrocarbons using adsorptive agents.* I&EC Process Design and Development, 3 (4), 361-365.

- Edgeworth, R. y Wooldridge, M., 1957. *Pilot Plants, Models and Scale-up Methods in Chemical Engineering.* McGraw-Hill Book Company, Inc., London.

- Fedorov, A.G. y Viskanta, R., 1999. *Analysis of transient heat/mass transfer and adsorption/desorption interactions.* International Journal of Heat and Mass Transfer, 42, 803-819.

- Feng, X. y Huang, Y.M., 1997. *Liquid separation by membrane pervaporation: a review.* Industrial Engineering Chemical Research, 36, 1048-1066.

- Foucher, E.R., Doherty, M.F. y Malone, M.F., 1991. *Automatic screening of entrainers for homogeneous azeotropic distillation.* Industrial Engineering Chemical Research, 30 (4), 761-771.

- Fox, C.R., 1985. Industrial wastewater control and recovery of organic chemicals by adsorption. Slejko, F.L. (Ed.) *Adsorption Technology*. Marcel Dekker, New York.

- Fritz, W. y Schluender, E.U., 1974. *Simultaneous adsorption equilibria of organic solutes in dilute aqueous solutions on activated carbon.* Chemical Engineering Science, 29, 1279-1282.

- Gani, R., Hytoft, G. y Jaksland, C., 1997. *Design and analysis of supercritical extraction processes.* Applied Thermal Engineering, 17 (8-10), 889-899.

- Geankoplis, C.J., 1993. *Transport Processes and Unit Operations,* 3rd ed., Prentice-Hall International Editions, Englewood Cliffs, N.J.

- Gehrhardt, H.M. y Kyle, B.G., 1967. *Fixed-bed, liquid-phase drying with molecular sieve adsorbent.* Industrial and Engineering Chemistry Process, Design and Development, 6 (3), 265-267.

- Ghazali, M., Nawawi, M. y Huang, R.Y.M., 1997. *Pervaporation dehydration of isopropanol with chitosan membranes.* Journal of Membrane Science, 124 (1), 53-62.

- Giles, C.H., McEwan, T.H., Nakhwa, S.N. y Smith, D., 1960. *Studies in adsorption. Part XI. A system of classification of solution adsorption isotherms and its use in diagnosis of adsorption mechanisms and in measurement of specific surface areas of solids.* Journal of Chemical Society, 3973-3992.

- Goto, M., Matsumoto, S., Yang, B.L. y Goto, S., 1986. *Dynamic drying of benzene with ion-exchange resin.* Journal of Chemical Engineering of Japan, 9 (5), 466-469.

- Gurvich, D.B., Balandina, V.A., Brichkin, N.I., Noskova, M.P. y Malikov, V.I., 1961. *Device for automatic determination of moisture content using Karl Fisher reagent.* Sov. Plas., 11, 35-38.

- Gyöngyhalmi, I., Földes-Berezsnich, T. y Tüdos, F., 1995. *Kinetics of radical polymerization LVII. Investigation of the effect of molecule inhibitors on the radical polymerization of p-methyl styrene (pMS). Aromatic nitro compounds.* European Polymer Journal, 31 (1), 45-49.

- Haberlein, R.A., 1999. *How to measure occupational exposures to styrene.* Article submitted to Composites Fabrication.

- Ham, G.E., 1967. *Kinetics and Mechanisms of Polymerization. Volume I. Vinyl Polymerization. Part I.* Marcel Dekker, Inc. New York.

- Hand, D.W., Ali, A.N., Bulloch, J.L., DeBraske, M.L., Crittenden, J.C. y Hokanson, D.R., 1999. *Adsorption equilibrium modeling of space station wastewaters.* Journal of Environmental Engineering, 540-547.

- Hashimoto, K., Miura, K. y Nagata, S., 1975. *Intraparticle diffusivities in liquid phase adsorption with nonlinear isotherms.* Journal of Chemical Engineering of Japan, 8 (5), 367-373.

- Himmelblau, D.M., 1970. *Process Analysis by Statistical Methods.* John Wiley and sons, New York.

- Huang, R.Y.M., Pal, R. y Moon, G.Y., 1999. *Crosslinked chitosan composite membrane for the pervaporation dehydration of alcohol mixtures and enhancement of structural stability of chitosan/polysulfone composite membranes.* Journal of Membrane Science, 160 (1),17-30.

- IISRP (International Institute of Synthetic Rubber Producers), 2001. *Information on the Styrene Industry worlwide*, International Institute of Synthetic Rubber Producers, Inc., http://www.iisrp.com (visitada 10/10/2001).

- Information Center for Natural Rubber, 2000. *Natural Rubber in the New Millenium*, http://www.rubber-stichting.ing.tno.nl (visitada 05/03/2002).

- Ingeniería Química (Edt.), 1999. *Complejo de estireno de Tarragona.* Ingeniería Química, 357, 87-91.

- IUPAC, 1994. *Recommendations for the characterization of porous solids. Technical Report.* Pure and Applied Chemistry, 66 (8), 1739-1758.

- Jaroniec, M. y Madey, R., 1988. *Physical Adsorption on Heterogeneous Solids.* Elsevier Science Publishers B.V., Amsterdam.

- Jin, W. y Zhu, S., 2000. *Study of adsorption equilibrium and dynamics of benzene, toluene and xylene on zeolite NaY.* Chemical Engineering and Technology, 23, 151-156.

- Jodra, L.G., Romero, A. y García-Ochoa, F., 1979. *Diseño de reactores de lecho fijo. Modelo, parámetros de diseño, estimación. Parte I. Modelos seudohomogéneos de una dimensión.* Ingeniería Química, Septiembre, 139-148.

- Joshi, S.R., 1987. *Adsorptive Drying of Organic Liquids.* PhD Dissertation, University of Texas, Austin.

- Joshi, S.R. y Fair, J.R., 1988. *Adsorptive drying of toluene.* Industrial Engineering Chemistry Research, 27, 2078-2085.

- Joshi, S.R. y Fair, J.R., 1991. *Adsorptive drying of hydrocarbon liquids.* Industrial Engineering Chemistry Research, 30, 177-185.

- Kaloidas, V., Thanos, A.M., Tsamatsoulis, D.C. y Papayannakos, N.G., 2000. *Preparation of Al_2O_3 carriers in an integrated mini pilot unit.* Chemical Engineering and Processing, 39, 407-416.

- Kärger, J., Pfeifer, H., Stallmach, F., Bülow, M., Struve, P., Entner, R., Spindler, H. y Seidel, R., 1990. *Influence of molecular shape on probing mass transfer resistances on zeolites.* AIChE Journal, 36 (10), 1500-1504.

- Kirk, R.E., Othmer, D.F., Grayson, M. y Eckroth, D., 1978. *Kirk-Othmer Encyclopedia of Chemical Technology*, 3rd ed., vols. 1, 8, John Wiley and Sons, Inc., New York.

- Kun, K.A. y Kunin, R., 1968. *Macroreticular resins. III. Formation of macroreticular styrene-divinylbenzene copolymers.* Journal of Polymer Science: Part A-1, 6, 2689-2701.

- Kusumocahyo, S.P. y Sudoh, M., 1999. *Dehydration of acetic acid by pervaporation with charged membranes.* Journal of Membrane Science, 161 (1), 77-83.

- Laganá, A., Crocchianti, S., Bolloni, A., Piermarini, V., Baraglia, R., Ferrini, R. y Laforenza, D., 2000. *Computational granularity and parallel models to scale up reactive scattering calculations.* Computer Physics Communications, 128, 295-314.

- Lane, W.H., 1946*. Determination of the solubility of styrene in water and of water in styrene.* Industrial and Engineering Chemistry, 18 (5), 295-296.

- Lange, J.P. y Mesters, C.M., 2001. *Mass transport limitations in zeolite catalysts: the dehydration of 1-phenyl-ethanol to styrene.* Applied Catalysis A: General, 210, 247-255.

- Lankford, P.W. y Eckenfelder, W.W., 1990. *Toxicity Reduction in Industrial Effluents.* Van Nostrand Reinhold.

- Lee, K.R., Liaw, D.J., Liaw, B.Y. y Lai, J.Y., 1997. *Selective separation of water from aqueous alcohol solution through fluorine-containing aromatic polyamide membranes by pervaporation.* Journal of Membrane Science, 131 (1-2),249-259.

- Lee, Y.M., Nam, S.Y. y Ha, S.Y., 1999. *Pervaporation of water/isopropanol mixtures through polyaniline membranes doped with poly(acrylic acid).* Journal of Membrane Science, 159 (1), 41-46.

- Lee, Y.M., Nam, S.Y. y Woo, D.J., 1998. *Pervaporation performance of beta-chitosan membrane for water/alcohol mixtures.* Journal of Polymer Engineering, 18 (1-2), 131-146.

- Lee, K.R., Teng, M.Y., Hsu, T.N. y Lai, J.Y., 1999. *A study on pervaporation of aqueous ethanol solution by modified polyurethane membrane.* Journal of Membrane Science, 162 (1), 173-180.

- Lee, J.F. y Wang, Y.C., 1998. *Dehydration of acetic acid/water mixture by pervaporation through a chemically modified poly(4-methyl-1-pentene) membrane.* Separation Science and Technology, 33 (2), 187-200.

- Lees, F.P., 1969. *Desorption into a dry gas for drying organic liquids.* Brittish Chemical Engineering, 14 (2), 173-174.

- Lelkes, Z., Szitkai, Z., Rev, E. y Fonyo, Z., 2000. *Rigorous MINLP model for ethanol dehydration system.* Computers and Chemical Engineering, 24, 1331-1336.

- Levenspiel, O., 1999. *Chemical Reaction Engineering*, 3rd ed., John Wiley and sons, New York.

- Leyva-Ramos, R. y Geankoplis, C.J., 1985. *Model simulation and analysis of surface diffusion of liquids in porous solids.* Chemical Engineering Science, 40 (5), 799-807.

- Liapis, A.I. y Rippin, D.W.T., 1977. *A general model for the simulation of multi-component adsorption from a finite bath.* Chemical Engineering Science, 32, 619-627.

- Liapis, A.I. y Rippin, D.W.T., 1978. *The simulation of binary adsorption in activated carbon columns using estimates of diffusional resistance within the carbon particles derived from batch experiments.* Chemical Engineering Science, 33, 593-600.

- Lipnizki, F., Field, R.W. y Ten, P.K., 1999. *Pervaporation-based hybrid process: a review of process design, applications and economics.* Journal of Membrane Science, 153, 183-210.

- López de Arbina, L., Gugliotta, L.M., Barandiaran, M.J. y Asua, J.M., 1998. *Effect of oxygen on emulsion polymerisation kinetics: a study by reaction calorimetry.* Polymer, 39 (17), 4047-4055.

- Loveland, J.W., Webster, T.B., Hablitzel, C.P. y Reed, G.W., 1958. *Determination of traces of water in hydrocarbons in gasoline boiling range. Sample handling and interferences.* Analytical Chemistry, 30, 1316-1320.

- Lukás, J., Richau, K., Schwarz, H.H. y Paul, D., 1997. *Surface characterization of polyelectrolyte complex membranes based on sodium cellulose sulfate and various cationic components.* Journal of Membrane Science, 131 (1-2), 39-47.

- Lyondell Chemical Company, 2000. *Styrene Monomer*.

- Mallevialle, J., Odendaal, P. y Wiesner, M. (Eds), 1998. *Tratamiento de Agua por Procesos de Membrana.* McGraw-Hill, Madrid.

- Marcussen, L., 1982. *Comparison of experimental and predicted breakthrough curves for adiabatic adsorption in fixed bed.* Chemical Engineering Science, 37 (2), 299-309.

- Mardare, D. y Matyjaszewski, K., 1994. *Thermal polymerization of styrene in the presence of stable radicals and inhibitors.* Polymer Preprints, 35 (1), 778-779.

- Martínez, V.H., Alonso, P.A., López, J., Salado, M. y Rocha, J.A., 2000. *Simulación de Procesos en Ingeniería Química.* Plaza y Valdés, Méjico.

- Martinswerk, 2000. *Compalox®. Activated Alumina for Adsorption of Chemical Products and Pollutants.*

- Massaldi. H.A. y Gottifredi, J.C., 1972. *Adsorption das un lit fixe – cas de trois resistances simultanees.* Chemical Engineering Science, 27, 1951-1956.

- Matheus, A.P. y Zayas, I., 1989. *Particle size and shape effects on adsorption rate parameters.* Journal of Environmental Engineering, 115 (1), 41-55.

- Matsas, G.M., Faliagas, A.C. y Simitzis, J.C., 1995. *Removal of polymerization inhibitors from styrene based on adsorption.* Die Angewandte Makromolekulare Chemie, 227 (3901), 35-42.

- McCabe, W., Smith, J. y Harriot, P., 1991. *Unit Operations of Chemical Engineering,* 5th ed., McGraw Hill, New York.

- McKay, G. y Allen, S.J., 1983. *Single resistance mass transfer models for the adsorption of dyes on peat.* Journal of Separation Process Technology, 4 (3), 1-7.

- McKay, G. y Bino, M.J., 1985. *Application of two resistance mass transfer model to adsorption systems.* Chemical Engineering Research and Design, 63 (3), 168-174.

- McKay, G., McKee, S y Walters, H.R.J., 1987. *Solid-liquid adsorption based on external mass transfer, macropore and micropore diffusion.* Chemical Engineering Science, 42 (5), 1145-1151.

- McKetta J.J. y Cunningham, W.A. (Eds.), 1976. *Encyclopedia of Chemical Processing and Design,* vol. 2. Marcel Dekker, Inc., New York.

- Merck, 1999. *Reactivos. Productos Químicos.* Merck Farma y Química, Barcelona.

- Meshko, V., Markovska, L., Mincheva, M. y Rodrigues, A.E., 2001. *Adsorption of basic dyes on granular activated carbon and natural zeolite.* Water Research, 35 (14), 3357-3366.

- Mettler Toledo, 1999. *Mettler toledo DL36 KF Coulometer. Operating Instructions.* Mettler Toledo AG, Suiza.

- Micromeritics, 1988. *Poresizer 9310. Versión, V1.05.*

- Micromeritics, 1992. *ASAP 2000. Versión, V2.02.*

- Misra, C., 1986. *Industrial Alumina Chemicals.* ACS Monograph 184. American Chemical Society, Washington.

- Mitchell, J. y Smith, D.M., 1977. *Aquametry. A Treatise on Methods for the Determination of Water. Part I,* 2nd ed., John Wiley and sons, New York.

- Mitchell, J. y Smith, D.M., 1980. *Aquametry. A Treatise on Methods for the Determination of Water. Part III. The Karl Fisher Reagent,* 2nd ed., John Wiley and sons, New York.

- Moïse, J.C., Bellat, J.P. y Méthivier, A., 2001. *Adsorption of water vapor on X and Y zeolites exchanged with barium.* Microporous and Mesoporous Materials, 43, 91-101.

- Moon, G.Y., Pal, R. y Huang, R.Y.M., 1999. *Novel two-ply composite membranes of chitosan and sodium alginate for the pervaporation dehydration of isopropanol and ethanol.* Journal of Membrane Science, 156 (1), 17-27.

- Mulder, M., 1996. *Basic Priciples of Membrane Technology,* 2nd ed., Kluwer Academic Publishers, Netherlands.

- Nam, S.Y., Chun, H.J. y Lee, Y.M., 1999. *Pervaporation separation of water-isopropanol mixture using carboxymethylated poly(vinyl alcohol) composite membranes.* Journal of Applied Polymer Science, 72 (2), 241-249.

- Nam, S.Y. y Lee, Y.M., 1999. *Pervaporation of ethylene glycol–water mixtures; I. Pervaporation performance of surface crosslinked chitosan membranes.* Journal of Membrane Science, 153 (2), 155-162.

- Nedez, C., 1997. *Procede d'elimination d'inhibiteurs de Polymerisation de Melanges de Monomeres a l'aide d'une Alumine de Forme Optimisee.* Institut National de la Propiété Industrielle, République Française, Paris.

- Needham, R.B., Campbell, J.M. y McLeod, H.O., 1966. *Critical evaluation of mathematical models used for dynamic adsorption of hydrocarbons.* Industrial Engineering Chemical Process Design and Development, 5, 122-128.

- Neitsch, M., Suckow, M. y Heschel, W., 1999. *Predicting of breakthrough curves for single and multicomponent adsorption of pollutants on activated carbon filters.* Chemische Technik, 51 (2), 55-63.

- Ng, K.C., Chua, H.T., Chung, C.Y., Loke, C.H., Kashiwagi, T., Akisawa, A. y Saha, B.B., 2001. *Experimental investigation of the silica gel-water adsorption isotherm characteristics.* Applied Thermal Engineering, 21, 1631-1642.

- Nilchan S. y Pantelides, C.C., 1998. *On the optimisation of periodic adsorption processes.* Adsorption, 4, 113-147.

- Nishino, J., 2001. *Adsorption of water vapor and carbon dioxide at carboxilic functional groups on the surface of coal.* Fuel, 80, 757-764.

- Nitta, T. y Shigeta, T., 1998. *Computer simulation studies of adsorption characteristics in supercritical fluids.* Fluid Phase Equilibria, 144, 245-256.

- Oh, M. y Pantelides, C.C., 1996. *A modeling and simulation language for combined lumped and distributed parameter systems.* Computers and Chemical Engineering, 20 (6/7), 611-633.

- Palluzi, R.P., 1992. *Pilot Plant Design, Construction and Operation.* McGraw-Hill, inc., New York.

- Panametrics, 1995. *Moisture Monitor Series 35. User's Manual 910-140A1.* Panametrics, Inc.

- Papee, D., Meniere, C., Bellier, A. y Jouanneault, F., 1967. *Optimize alumina gas drying systems.* Hydrocarbon Processing, 46 (10), 142-146.

- Peel, R.G., Benedek, A. y Crowe, C.M., 1981. *A branched pore kinetic model for activated carbon adsorption.* AIChE Journal, 27 (1), 26-32.

- Perry, R.H. y Green D.W., (Eds.) 1997. *Perry's Chemical Engineers' Handbook,* 7th ed., McGraw-Hill, New York.

- Pinto, J.C. y Ray, W.H., 1996. *The Dynamic Behaviour of Continuous Solution Polymerization Reactors –IX. Effects of Inhibition.* Chemical Engineering Science, 51 (1), 63-79.

- Pinto, R.T.P., Wolf-Maciel, M.R. y Lintomen, L., 2000. *Saline extractive distillation process for ethanol purification.* Computers and Chemical Engineering, 24, 1689-1694.

- Pota, A.A. y Matheus, A.P., 2000*. Adsorption dynamics in stratified convergent tapered bed.* Chemical Engineers Science, 55, 1399-1409.

- Prasher, B.D. y Ma, Y.H., 1977. *Liquid diffusion in microporous alumina pellets.* AIChE Journal, 23 (3), 303-311.

- Process Systems Enterprise Ltd., 1997. *gPROMS Technical Document.*

- Qi, S., Hay, K.J. y Rood, M.J., 1998. *Isotherm equation for water vapor adsorption onto activated carbon.* Journal of Environmental Engineering, november, 1130-1134.

- Raghavan, N.S., Hassan, M.M. y Ruthven, D.M., 1985. *Numerical simulation of a PSA system. Part I: Isothermal trace component system with linear equilibrium and finite mass transfer resistance.* AIChE Journal, 31 (3), 385-392.

- Raghavan, N.S. y Ruthven, D.M., 1984. *Dynamic behaviour of an adiabatic adsorption column-II.* Chemical Engineering Science, 39 (7/8), 1201-1212.

- Rajasree, R. y Mohair, A.S., 2000. *Simulation based synthesis, design and optimization of pressure swing adsorption (PSA) processes.* Computers and Chemical Engineering, 24, 2493-2505.

- Rao, M.B. y Sirkar, S., 1993. *Liquid-phase adsorption of bulk ethanol-water mixtures by alumina.* Adsorption Science and Technology, 10, (1-4), 93-104.

- Rasmuson, A., 1985. *The effect of particles of variable size, shape and properties on the dynamics of fixed beds.* Chemical Engineering Science, 40 (4), 621-629.

- Rautenbach R. y Vier, J., 1995. *Design and analysis of combined distillation/pervaporation processes.* Proc. 7th International Conference Pervaporation Processes in the Chemical Industry, R. Bakish ed., Bakish Materials Corp., Englewood, 70-85.

- Ray, S.K., Sawant, S.B., Joshi, J.B. y Pangarkar, V.G., 1998. *Dehydration of acetic acid by pervaporation.* Journal of Membrane Science, 138 (1), 1-17.

- Ray, M.S. y Sneesby, M.G., 1998. *Chemical Engineering Design Project. A Case Study Approach,* 2nd ed., Gordon and Breach Science Publishers, Amsterdam.

- Reid, R.C., Prausnitz, J.M. y Poling, B.E., 1987*. The Properties of Gases and Liquids*, 4th ed., McGraw-Hill, New York.

- Repsol, 1999. Comunicación personal.

- Rhône-Poulenc, 1999. *Département Alumines*. Rhône-Poulenc Chimie.

- Rodrigues, A.E., LeVan, M.D. y Tondeur, D. (Eds.), 1989. *Adsorption: Science and Technology. NATO ASI Series*, vol. 158. Kluwer Academic Publishers, Dordrecht.

- Rosen, J.B., 1952*. Kinetics of a fixed bed system for solid diffusion into spherical particles.* The Journal of Chemical Physics, 20 (3), 387-394.

- Rosen J.B., 1954. *General numerical solution for solid diffusion in fixed beds.* Industrial and Engineering Chemistry, 46 (8), 1590-1594.

- Rousseau, R.W., 1987. *Handbook of Separation Process Technology.* John Wiley and Sons, New York.

- Rudzinski, W. y Everett, D.H., 1992. *Adsorption of Gases on Heterogeneous Surfaces.* Academic Press, London.

- Ruthven, D.M., 1984. *Principles of Adsorption and Adsorption Processes.* John Wiley and Sons, New York.

- Samaras, P., Diamadopoulos, E. y Sakellaropoulos, G.P., 1995. *Relationship between the activated carbon surface area and adsorption model coefficients for removal of phenol from water.* Water Quality Research Journal, Canada, 3 (2), 325-337.

- San, J.Y., Hsu, Y.C. y Wu, L.J., 1998. *Adsorption of toluene on activated carbon in a packed bed.* International Journal of Heat and Mass Transfer, 41, 3229-3238.

- Sander, U. y Soukup, P., 1988. *Design and operation of a pervaporation plant for ethanol dehydration.* Journal of Mambrane Science, 36, 463-475.

- Santacesarea, E., Morbidelli, M., Servida, A., Storti, G. y Carra, S., 1982. *Separation of xylenes on Y zeolites. 2. Breakthrough curves and their interpretation.* Industrial and Engineering Chemistry Process Design and Development, 21, 446-451.

- Santhiya, D., Subramanian, S., Natarajan, K.A. y Malghan, S.G., 1999. *Surface chemical studies on the competitive adsorption of poly(acrylic acid) and poly(vinyl alcohol) onto alumina.* Journal of Colloid and Interface Science, 216 (1), 143-153.

- Sasloglou, S.A., Petru, J.K., Kanellopoulos, N.K. y Androutsopoulos, G.P., 2000. *Realistic random sphere pack model for the prediction of sorption isotherms.* Microporous and Mesoporous materials, 39, 477-483.

- Scott, K., 1995. *Handbook of Industrial Membranes.* Elsevier Advanced Technology, Oxford.

- Seguin, D., Montillet, A., Brunjail, D. y Comiti, J., 1996. *Liquid-solid mass transfer in packed beds of variously shaped particles at low Reynolds numbers: experiments and model.* The Chemical Engineering Journal, 63, 1-9.

- Semenova, S.I., Ohya, H. y Soontarapa, K., 1997. *Hydrophilic membranes for pervaporation: An analytical review.* Desalination, 110, 251-286.

- Seymour R.B. y Carraher, C.E., 1998. *Introducción a la química de los polímeros.* Reverté, D.L., Barcelona.

- Silva, J. y Rodrigues, A.E., 1998. *Separation of n/iso-paraffins mixtures by pressure swing adsorption.* Separation and Purification Technology, 13, 195-208.

- Sircar, S. Myers, A.L. y Molstad, M.C., 1970. *Adsorption of dilute solutes from liquid mixtures.* Transmissions of the Faraday Society, 66, 2354-2363.

- Skelland, A.H.P., 1974. *Diffusional Mass Transfer*, Robert E. Krieger Publishing Co, Inc., Malabar, Florida.

- Smith, S., 1998. *Extraction of Additives from Polystyrene and Subsequent Analysis*. Thesis for the degree of Master of Science in Chemistry, Virginia State University, Blacksburg, Virginia.

- Song, K.M. y Hong, W.H., 1997. *Dehydration of ethanol and isopropanol using tubular type cellulose acetate membrane with ceramic support in pervaporation process.* Journal of Membrane Science, 123 (1), 27-33.

- Sood, A. y Feming, H.L., 1987. *Purification of liquid ethylene dichloride by adsorption.* AIChE Symposium Series, 83 (259), 40-51.

- Sterling Chemical Inc., 2000. Technical Bulletin. Safe Handling and Storage of Styrene Monomer.

- Storey, R.F., Messman, J.M., Henderson, J.E. y Pitman, P.E., 2001. *Efficiency of various free-radical inhibitors in unsaturated polyester resins.* School of Polymers and High Performance Materials. The University of Southern Mississippi. http://www.firstcureonline.com (visitada 05/12/2001).

- Strasburger, E. y Denffer, D., 1986. *Tratado de botánica*, 7ª ed., Marín, Barcelona.

- Svedberg, U.G., 1979. *Simulation and scale-up of adsorption columns.* Computers and Chemical Engineering, 3 (1-4), 549-551.

- Szekeres, M., Tombácz, E., Ferencz, K. y Dékány, I., 1998. *Adsorption of salicylate on alumina surfaces.* Colloids and Surfaces. A: Physicochemical and Engineering Aspects, 141, 319-325.

- Teo, W.K. y Ruthven, D.M., 1986. *Adsorption of water from aqueous ethanol using 3-A molecular sieves.* Industrial and Engineering Chemistry Process Design and Development, 25 (1), 17-21.

- Tien, C., 1994. *Adsorption Calculations and Modeling.* Butterworth-Heinemann Series in Chemical Engineering, Newton, MA.

- Treybal, R.E., 1991. *Operaciones de transferencia de masa,* 2ª ed. en español, McGraw-Hill, Méjico.

- Tsai, W.T., Chang, C.Y., Ho, C.Y. y Chen, L.Y., 1999. *Simplified description of adsorption breakthrough curves of 1,1-dichloro-1-fluoroethane (HCFC-141b) on activated carbon with temperature effect.* Journal of Colloid and Interface Science, 214 (2), 455-458.

- Ullmann, F. 1999. *Ullmann's Encyclopedia of Industrial Chemistry,* 6th ed., Electronic Release.

- UOP, 1999. *Activated alumina ST-1000. Product & Performance Data.*

- US-EPA, 1993. *Locating and Estimating Air Emissions from Sources of Styrene.* Reporte EPA-454/R-93-011. Office of Air Quality Planning and Standards Research Triangle Park, NC.

- Valenzuela, D.P. y Myers, A.L., 1989. *Adsorption Equilibrium Data Handbook.* Prentice-Hall International Editions, Englewood Cliffs, N.J.

- Van Gulik, C., 1998. *Using computational fluid dynamics to calculate transversal dispersion in a structured packed bed.* Computers and Chemical Engineering, 22, (suppl), S767-S770.

- Vasconcelos, C.J.G. y Wolf-Maciel, M.R., 2000. *Dynamic and control of high purity heterogeneous azeotropic distillation process.* European Symposium on Computer Aided Process Engineering-10. S. Pierucci ed., 217-222.

- Wakao, N. y Funazkri, T., 1978. *Effect of fluid dispersion coefficients on particle-to-fluid mass transfer coefficients in packed beds.* Chemical Engineering Science, 33, 1375-1384.

- Wankat, P.C., 1994. *Rate-Controlled Separations.* Blackie Academic and Professional, London.

- Walker, G.M. y Weatherley, L.R., 2001. *COD removal from textile industry effluent: pilot plant studies.* Chemical Engineering Journal, 84, 125-131.

- Wang, X.P., Feng, Y.F. y Shen, Z.Q., 2000. *Pervaporation properties of a three-layer structure composite membrane.* Journal of Applied Polymer Science, 75 (6), 740-745.

- Wang, X.P., Shen, Z.Q., Zhang, F.Y. y Zhang, Y.F., 1996. *A novel composite chitosan membrane for the separation of alcohol-water mixtures.* Journal of Membrane Science, 119 (2), 191-198.

- Warter, M. y Stichlmair, J., 2000. *Batch distillation of azeotropic mixtures in a column with a middle vessel.* European Symposium on Computer Aided Process Engineering-10. S. Pierucci ed., 691-696.

- Wasylkiewicz, S.K., Kobylka, L.C. y Castillo, F.J.L., 2000. *Optimal design of complex azeotropic distillation columns.* Chemical Engineering Journal, 79, 219-227.

- Wilson, E.J. y Geankoplis, C.J., 1966. *Liquid mass transfer at very low Reynolds numbers in packed beds.* Industrial and Engineering Chemistry Fundamentals, 5 (1), 9-14.

- Wisniak, J., 1998. *The influence of distillation conditions on the azeotropic composition.* Journal of Chemical Education, 75 (11), 1486-1490.

- Wolborska, A., 1999. *External film control of the fixed bed adsorption.* Chemical Engineering Journal, 73, 85-92.

- Wood, G.O., 1987. *A model for adsorption capacities of charcoal beds: II. Challenge concentration effects.* American Industrial Hygiene Association Journal, 48 (8), 703-709.

- Woosley, R.D., Baker, G.K. y Stubblefield, D.J., 1971. *Use of the computer to select design parameters for solid adsorbent dehydration of gas streams.* AIChE Symposium Series, 67 (117), 98-102.

- Yang, X.Y. y Al-Duri, B., 2001. *Application of branched pore diffusion model in the adsorption of reactive dyes on activated carbon.* Chemical Engineering Journal, 83, 15-23.

- Yang, Y., Wang, J., Wang, W.Y. y Ding, M., 1998. *Pervaporation of ethanol-water through polyelectrolyte complex membrane of chitosan-carboxymethylcellulose*. Journal of Functional Materials 29 (6), 642-644.

- Yeung, T.W. y Malino, H.M., 1988. *Bulk Removal of Water from Organic Liquids. Selective Adsorption by Molecular Sieve.* U.S. Patent.

- Yoon, Y.H. y Nelson, J.H., 1984. *Aplication of gas adsorption kinetics. I. A theoretical model for respirator cartridge service life.* American Industrial Hygiene Association Journal, 45 (8), 509-516.

- Yun, J.H., Choi, D.K. y Moon, H., 2000. *Benzene adsorption and hot purge regeneration in activated carbon beds.* Chemical Engineering Science, 55, 5857-5872.

- Zlokarnik, M., 1991. *Dimensional Analysis and Scale-up in Chemical Engineering.* Springer, Berlín.

- Zlokarnik, M., 1998. *Problems in the application of dimensional analysis and scale-up of mixing operations.* Chemical Engineering Science, 53 (17), 3023-3030.