

This article was downloaded by:

On: 25 January 2011

Access details: *Access Details: Free Access*

Publisher *Taylor & Francis*

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



## Separation Science and Technology

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713708471>

## Equilibrium-Staged Separations: A Bibliography Update (2004)

Martyn S. Ray<sup>a</sup>

<sup>a</sup> Department of Chemical Engineering, Curtin University of Technology, Perth, Western Australia

**To cite this Article** Ray, Martyn S.(2005) 'Equilibrium-Staged Separations: A Bibliography Update (2004)', Separation Science and Technology, 40: 10, 2153 – 2182

**To link to this Article:** DOI: 10.1081/SS-200068494

**URL:** <http://dx.doi.org/10.1081/SS-200068494>

PLEASE SCROLL DOWN FOR ARTICLE

Full terms and conditions of use: <http://www.informaworld.com/terms-and-conditions-of-access.pdf>

This article may be used for research, teaching and private study purposes. Any substantial or systematic reproduction, re-distribution, re-selling, loan or sub-licensing, systematic supply or distribution in any form to anyone is expressly forbidden.

The publisher does not give any warranty express or implied or make any representation that the contents will be complete or accurate or up to date. The accuracy of any instructions, formulae and drug doses should be independently verified with primary sources. The publisher shall not be liable for any loss, actions, claims, proceedings, demand or costs or damages whatsoever or howsoever caused arising directly or indirectly in connection with or arising out of the use of this material.

## Equilibrium-Staged Separations: A Bibliography Update (2004)

**Martyn S. Ray**

Department of Chemical Engineering, Curtin University of Technology,  
Perth, Western Australia

**Abstract:** This article continues a series of annual bibliographic updates of the published literature (since 1980) on distillation and other equilibrium-staged separation processes (1–13). This paper provides a useful and quick reference source to the 2004 journal literature (from the 50 most important chemical engineering journals) for researchers in this area. The following topics are included:

Distillation Design, Control, and Applications

Column Design Data

Absorption Reactions and Absorber Design, Cooling Towers

Liquid-Liquid Extraction

Supercritical Extraction

### DISTILLATION DESIGN, CONTROL, AND APPLICATIONS

Al-Arfaj, M.A., and Luyben, W.L. (2004) Plantwide control for TAME production using reactive distillation. *AIChE J.*, 50(7), 1462–1473.

Almeida-Rivera, C., and Grievink, J. (2004) Feasibility of equilibrium-controlled reactive distillation process: Application of residue curve mapping. *Comput. Chem. Eng.*, 28(1), 17–25.

Received 2 May 2005, Accepted 4 May 2005

Address correspondence to Martyn S. Ray, Department of Chemical Engineering, Curtin University of Technology, GPO Box U1987, Perth 6845, Western Australia.  
E-mail: M.Ray@curtin.edu.au

- Almeida-Rivera, C.P., Swinkels, P.L.J., and Grievink, J. (2004) Designing reactive distillation processes: Present and future. *Comput. Chem. Eng.*, 28(10), 1997–2020.
- An, W., Chuang, K.T., and Sanger, A.R. (2004) Dehydration of methanol to dimethyl ether by catalytic distillation. *Can. J. Chem. Eng.*, 82(5), 948–955.
- Aristovich, V.Y., Aristovich, Y.V., and Sokolov, A.Y. (2004) Novel energy-saving method of rectification, *Chem. Eng. Commun.*, 191(6), 844–860.
- Aslam, N., and Sunol, A.K. (2004) Reliable computation of binary homogeneous azeotropes of multi-component mixtures at higher pressures through equation of states. *Chem. Eng. Sci.*, 59(3), 599–609.
- Avramenko, Y., Nystrom, L., and Kraslawski, A. (2004) Selection of internals for reactive distillation column: Case-based reasoning approach. *Comput. Chem. Eng.*, 28(1), 37–44.
- Bahar, A., Ozgen, C., and Leblebicioglu, K. (2004) Artificial neural network estimator design for the inferential model predictive control of an industrial distillation column. *Ind. Eng. Chem. Res.*, 43(19), 6102–6111.
- Bandyopadhyay, S., Mishra, M., and Shenoy, U.V. (2004) Energy-based targets for multiple-feed distillation columns. *AIChE J.*, 50(8), 1837–1853.
- Barletta, T., and Kurzym, K.J. (2004) Consider retrofits to handle high-viscosity crudes. *Hydrocarbon Process.*, 83(9), 49–58.
- Barttfeld, M., Aguirre, P.A., and Grossmann, I.E. (2004) A decomposition method for synthesizing complex column configurations using tray-by-tray GDP models. *Comput. Chem. Eng.*, 28(11), 2165–2188.
- Baur, R., and Krishna, R. (2004) Distillation column with reactive pump arounds: An alternative to reactive distillation. *Chem. Eng. Process.*, 43(3), 435–445.
- Bek-Pedersen, E., and Gani, R. (2004) Design and synthesis of distillation systems using a driving-force-based approach. *Chem. Eng. Process.*, 43(3), 251–262.
- Benz, S.J., Francesconi, J.A., and Scenna, N.J. (2004) Strategies for starting up azeotropic distillation columns with multiple steady states. *Can. J. Chem. Eng.*, 82(5), 920–929.
- Bezzo, F., Varrasso, S., and Barolo, M. (2004) On the controllability of middle-vessel continuous distillation columns. *Ind. Eng. Chem. Res.*, 43(11), 2721–2729.

- Bhandari, N., and Rollins, D. (2004) Continuous-time Hammerstein nonlinear modeling applied to distillation. *AIChE J.*, 50(2), 530–533.
- Bisowarno, B.H., Tian, Y.C., and Tade, M.O. (2004) Intraction of separation and reactive stages on ETBE reactive distillation columns. *AIChE J.*, 50(3), 646–653.
- Bisowarno, B.H., Tian, Y.C., and Tade, M.O. (2004) Application of side reactors on ETBE reactive distillation. *Chem. Eng. J.*, 99(1), 35–43.
- Blancarte-Palacios, J.L., and Bautista-Valdes, M.N. (2004) Energy-efficient designs of thermally coupled distillation sequences for four-component mixtures (correction). *Ind. Eng. Chem. Res.*, 43(22), 7207–7208.
- Bonsfills, A., and Puigjaner, L. (2004) Batch distillation: Simulation and experimental validation. *Chem. Eng. Process.*, 43(10), 1239–1252.
- Bruggemann, S., and Marquardt, W. (2004) Shortcut methods for nonideal multicomponent distillation: 3. Extractive distillation columns. *AIChE J.*, 50(6), 1129–1149.
- Bruggemann, S., Oldenburg, J., Zhang, P., and Marquardt, W. (2004) Robust dynamic simulation of three-phase reactive batch distillation columns. *Ind. Eng. Chem. Res.*, 43(14), 3672–3684.
- Buchelli, A., Call, M.L., and Brown, A.L. (2004) Nonequilibrium behavior in ethylene/polyethylene flash separators. *Ind. Eng. Chem. Res.*, 43(7), 1768–1778.
- Burri, J.F., and Manousiouthakis, V.I. (2004) Global optimization of reactive distillation networks using IDEAS. *Comput. Chem. Eng.*, 28(12), 2509–2521.
- Caballero, J.A., and Grossmann, I.E. (2004) Design of distillation sequences: From conventional to fully thermally coupled distillation systems. *Comput. Chem. Eng.*, 28(11), 2307–2329.
- Caetano, M.G., Gonzalez, J.C., and Solari, R.B. (2004) Flowdynamic modeling of bale-type catalytic distillation packings. *Sep. Sci. Technol.*, 39(4), 855–877.
- Cai, T.J., and Chen, G.X. (2004) Liquid back-mixing on distillation trays. *Ind. Eng. Chem. Res.*, 43(10), 2590–2597.
- Canizares, P., Garcia-Gomez, J., Martinez, F., and Rodrigo, M.A. (2004) Evaluation of a simple batch distillation process for treating wastes from metalworking industries. *J. Chem. Technol. Biotechnol.*, 79(5), 533–539.
- Cheng, G.S., and Zhang, W.D. (2004) Model-free adaptive technology improves distillation column chain control. *Hydrocarbon Process.*, 83(10), 57–62.

- Chien, I.L., Zeng, K.L., and Chao, H.Y. (2004) Design and control of a complete heterogeneous azeotropic distillation column system. *Ind. Eng. Chem. Res.*, 43(9), 2160–2174.
- Chien, I.L., Zeng, K.L., Chao, H.Y., and Liu, J.H. (2004) Design and control of acetic acid dehydration system via heterogeneous azeotropic distillation. *Chem. Eng. Sci.*, 59(21), 4547–4567.
- Chin, J., Kattukaran, H.J., and Lee, J.W. (2004) Generalized feasibility evaluation of equilibrated quaternary reactive distillation systems. *Ind. Eng. Chem. Res.*, 43(22), 7092–7102.
- Citro, F., and Lee, J.W. (2004) Widening the applicability of reactive distillation technology by using concurrent design. *Ind. Eng. Chem. Res.*, 43(2), 375–383.
- Cypes, S.H., and Engstrom, J.R. (2004) Analysis of a toluene stripping process: A comparison between a microfabricated stripping column and a conventional packed tower. *Chem. Eng. J.*, 101(1), 49–56.
- Darton, R.C., Supino, S., and Sweeting, K.J. (2004) Development of a multistaged foam fractionation column, *Chem. Eng. Process.*, 43(3), 477–482.
- Demicoli, D., and Stichlmair, J. (2004) Separation of ternary mixtures in a batch distillation column with side withdrawal. *Comput. Chem. Eng.*, 28(5), 643–650.
- Dhale, A.D., Myrant, L.K., and Chopade, S.P. (2004) Propylene glycol and ethylene glycol recovery from aqueous solution via reactive distillation. *Chem. Eng. Sci.*, 59(14), 2881–2890.
- Diamond, D., Hahn, T., and Becker, H. (2004) Improving the understanding of a novel complex azeotropic distillation process using a simplified graphical model and simulation. *Chem. Eng. Process.*, 43(3), 483–493.
- Dimian, A.C., Omota, F., and Blik, A. (2004) Entrainer-enhanced reactive distillation. *Chem. Eng. Process.*, 43(3), 411–420.
- Dirk-Faitakis, C.B., and Chuang, C.T. (2004) Simulation studies of catalytic distillation for removal of water from ethanol using a rate-based kinetic model. *Ind. Eng. Chem. Res.*, 43(3), 762–768.
- Duarte, C., and Loureiro, J.M. (2004) Effect of adsorption on residue curve maps for heterogeneous catalytic distillation systems. *Ind. Eng. Chem. Res.*, 43(13), 3242–3250.
- Elgue, S., Prat, L., and Cabassud, M. (2004) Dynamic models for start-up operations of batch distillation columns with experimental validation. *Comput. Chem. Eng.*, 28(12), 2735–2747.

- Engelien, H.K., and Skogestad, S. (2004) Selecting appropriate control variables for a heat-integrated distillation system with prefractionator. *Comput. Chem. Eng.*, 28(5), 683–691.
- Espinosa, J., Salomone, E., and Iribarren, O. (2004) Computer-aided conceptual design of batch distillation systems. *Ind. Eng. Chem. Res.*, 43(7), 1723–1733.
- Espinosa-Pena, M., Figueroa-Gomez, Y., and Jimenez-Cruz, F. (2004) Simulated distillation yield curves in heavy crude oils: A comparison of precision between ASTM D-5307 and ASTM D-2892 physical distillation. *Energy Fuels*, 18(6), 1832–1840.
- Fang, Y.J., and Xiao, W.D. (2004) Experimental and modeling studies on a homogeneous reactive distillation system for dimethyl carbonate synthesis by transesterification. *Sep. Purif. Technol.*, 34(1), 255–263.
- Fiedler, S., and Auracher, H. (2004) Experimental and theoretical investigation of reflux condensation in an inclined small diameter tube. *Int. J. Heat Mass Transfer*, 47(19), 4031–4043.
- Fu, J. (2004) Simulation of salt-containing extractive distillation for the system of ethanol/water/ethanediol/KAc. 1. Calculation of the vapor-liquid equilibrium for the salt-containing system. *Ind. Eng. Chem. Res.*, 43(5), 1274–1278.
- Fu, J. (2004) Simulation of salt-containing extractive distillation for the system of ethanol/water/ethanediol/KAc. 2. Simulation of salt-containing extractive distillation. *Ind. Eng. Chem. Res.*, 43(5), 1279–1283.
- Gadewar, S.B., Tao, L., Malone, M.F., and Doherty, M.F. (2004) Process alternatives for coupling reaction and distillation. *Chem. Eng. Res. Des.*, 82(2), 140–147.
- Gangadwala, J., Kienle, A., and Stein, E. (2004) Production of butyl acetate by catalytic distillation: Process design studies. *Ind. Eng. Chem. Res.*, 43(1), 136–143.
- Gentry, J.C., Kumar, S., and Wright-Wytcherley, R. (2004) Use extractive distillation to simplify petrochemical processes. *Hydrocarbon Process.*, 83(6), 62–66.
- Greene, D., and Vago, G.G. (2004) Properly employ overhead condensers for vacuum columns. *Chem. Eng. Prog.*, 100(2), 38–43.
- Groemping, M., Dragomir, R.M., and Jobson, M. (2004) Conceptual design of reactive distillation columns using stage composition lines. *Chem. Eng. Process.*, 43(3), 369–382.
- Gruner, S., and Kienle, A. (2004) Equilibrium theory and nonlinear waves for reactive distillation columns and chromatographic reactors. *Chem. Eng. Sci.*, 59(4), 901–918.

- Guo, Z., and Lee, J.W. (2004) Feasible products in batch reactive extractive distillation. *AIChE J.*, 50(7), 1484–1492.
- Guo, Z., Chin, J., and Lee, J.W. (2004) Feasibility of continuous reactive distillation with azeotropic mixtures. *Ind. Eng. Chem. Res.*, 43(14), 3758–3769.
- Halvorsen, I.J., and Skogestad, S. (2004) Shortcut analysis of optimal operation of Petlyuk distillation. *Ind. Eng. Chem. Res.*, 43(14), 3994–3999.
- Han, M., Lin, H., and Wang, J. (2004) Fluid dynamics of a novel reactive distillation reactor. *Sep. Purif. Technol.*, 34(1), 247–253.
- Higler, A., Chande, R., Taylor, R., Baur, R., and Krishna, R. (2004) Non-equilibrium modeling of three-phase distillation. *Comput. Chem. Eng.*, 28(10), 2021–2036.
- Hiwale, R.S., Bhate, N.V., Mahajan, Y.S., and Mahajani, S.M. (2004) Industrial applications of reactive distillation: Recent trends. *Int. J. Chem. Reactor Eng.* (electronic), Vol. 2: R1.
- Hoffmann, A., Noeres, C., and Gorak, A. (2004) Scale-up of reactive distillation columns with catalytic packings. *Chem. Eng. Process.*, 43(3), 383–395.
- Hoffmaster, W.R., and Hauan, S. (2004) Difference points in reactive and extractive cascades. III. Properties of column section profiles with arbitrary reaction distribution. *Chem. Eng. Sci.*, 59(17), 3671–3693.
- Holiastos, K., and Manousiouthakis, V. (2004) Infinite-dimensional state-space (IDEAS) approach to globally optimal design of distillation networks featuring heat and power integration. *Ind. Eng. Chem. Res.*, 43(24), 7826–7842.
- Huerta-Garrido, M.E., Rico-Ramirez, V., and Hernandez-Castro, S. (2004) Simplified design of batch reactive distillation columns. *Ind. Eng. Chem. Res.*, 43(14), 4000–4011.
- Inamdar, S.V., Gupta, S.K., and Saraf, D.N. (2004) Multi-objective optimization of an industrial crude distillation unit using the elitist non-dominated sorting genetic algorithm. *Chem. Eng. Res. Des.*, 82(5), 611–623.
- Jimenez, E.S., Salamon, P., and Rivero, R. (2004) Optimization of a diabatic distillation column with sequential heat exchangers. *Ind. Eng. Chem. Res.*, 43(23), 7566–7571.
- Kachur, J.P., Afacan, A., and Chuang, K.T. (2004) Use of structured packing as a dualflow tray in distillation. *Chem. Eng. Res. Des.*, 82(7), 813–820.
- Kamphausen, A.H., and O'Donnell, J.A. (2004) Plant-model mismatch analysis in deethyleniser simulation. 2. Application to data-model selection and tuning. *Ind. Eng. Chem. Res.*, 43(24), 7888–7899.

- Kaymak, D.B., and Luyben, W.L. (2004) Quantitative comparison of reactive distillation with conventional multiunit reactor/column/recycle systems for different chemical equilibrium constants. *Ind. Eng. Chem. Res.*, 43(10), 2493–2507.
- Kaymak, D.B., and Luyben, W.L. (2004) Effect of the chemical equilibrium constant on the design of reactive distillation columns. *Ind. Eng. Chem. Res.*, 43(14), 3666–3671.
- Kaymak, D.B., and Luyben, W.L. (2004) Design of distillation columns with external side reactors. *Ind. Eng. Chem. Res.*, 43(25), 8049–8056.
- Kaymak, D.B., Luyben, W.L., and Smith, O.J. (2004) Effect of relative volatility on the quantitative comparison of reactive distillation and conventional multi-unit systems. *Ind. Eng. Chem. Res.*, 43(12), 3151–3162.
- Kenig, E.Y., Gorak, A., and Pyhalahiti, A. (2004) Advanced rate-based simulation tool for reactive distillation. *AIChE J.*, 50(2), 322–342.
- Khayet, M., and Matsuura, T. (2004) Pervaporation and vacuum membrane distillation processes: Modeling and experiments. *AIChE J.*, 50(8), 1697–1712.
- Khayet, M., Godino, M.P., and Mengual, J.I. (2004) Study of asymmetric polarization in direct contact membrane distillation. *Sep. Sci. Technol.*, 39(1), 125–147.
- Kim, J.K., and Wankat, P.C. (2004) Quaternary distillation systems with less than N-1 columns. *Ind. Eng. Chem. Res.*, 43(14), 3838–3846.
- Kim, K.J., Diwekar, U., and Tomazi, K. (2004) Entrainer selection and solvent recycling in complex batch distillation. *Chem. Eng. Commun.*, 191(12), 1606–1633.
- Kister, H.Z. (2004) Component trapping in distillation towers: Causes, symptoms and cures. *Chem. Eng. Prog.*, 100(8), 22–33.
- Kister, H.Z., and Litchfield, J.F. (2004) Distillation: Diagnosing instabilities in the column overhead. *Chem. Eng. (N.Y.)*, 111(9), 56–59.
- Kloker, M., Kenig, E.Y., and Gorak, A. (2004) Investigation of different column configurations for the ethyl acetate synthesis via reactive distillation. *Chem. Eng. Process.*, 43(6), 791–801.
- Kolbe, B., and Wenzel, S. (2004) Novel distillation concepts using one-shell columns. *Chem. Eng. Process.*, 43(3), 339–346.
- Kolodziej, A., Jaroszynski, M., and Salacki, W. (2004) Catalytic distillation for TAME synthesis with structured catalytic packings. *Chem. Eng. Res. Des.*, 82(2), 175–184.

- Leboreiro, J., and Acevedo, J. (2004) Processes synthesis and design of distillation sequences using modular simulators: A genetic algorithm framework. *Comput. Chem. Eng.*, 28(8), 1223–1236.
- Lee, J.Y., Kim, Y.H., and Hwang, K.S. (2004) Application of a fully thermally coupled distillation column for fractionation process in naphtha reforming plant. *Chem. Eng. Process.*, 43(4), 495–501.
- Lei, Z., Li, C., Li, J., and Chen, B. (2004) Suspension catalytic distillation of simultaneous alkylation and transalkylation for producing cumene. *Sep. Purif. Technol.*, 34(1), 265–271.
- Lei, Z., Li, C., Li, Y., and Chen, B. (2004) Separation of acetic acid and water by complex extractive distillation. *Sep. Purif. Technol.*, 36(2), 131–138.
- Lek, C.M., Rangaiah, G.P., and Hidajat, K. (2004) Distillation: Revisiting some rules of thumb. *Chem. Eng. (N.Y.)*, 111(9), 50–55.
- Lextrait, S., Eldridge, R.B., and Edgar, T.F. (2004) Steady-state rate-based simulation of packed reactive distillation: Spatial discretization. *Ind. Eng. Chem. Res.*, 43(14), 3855–3869.
- Liu, G., Jobson, M., Smith, R., and Wahnschafft, O.M. (2004) Shortcut design method for columns separating azeotropic mixtures. *Ind. Eng. Chem. Res.*, 43(14), 3908–3923.
- Liu, Z.T., and Jobson, M. (2004) Retrofit design for increasing the processing capacity of distillation columns: 1. A hydraulic performance indicator. *Chem. Eng. Res. Des.*, 82(1), 3–9.
- Liu, Z.T., and Jobson, M. (2004) Retrofit design for increasing the processing capacity of distillation columns: 2. Proposing and evaluating design options. *Chem. Eng. Res. Des.*, 82(1), 10–17.
- Llano-Restrepo, M., and Aguilar-Arias, J. (2004) Erratum to “Modeling and simulation of saline extractive distillation columns for the production of absolute ethanol”. *Comput. Chem. Eng.*, 28(12), 2851.
- Low, K.H., and Sorensen, E. (2004) Simultaneous optimal design and operation of multipurpose batch distillation columns. *Chem. Eng. Process.*, 43(3), 273–289.
- Lucia, A., and Yang, F. (2004) Solving distillation problems by terrain methods. *Comput. Chem. Eng.*, 28(12), 2541–2545.
- Luyben, W.L. (2004) Alternative control structures for distillation columns with partial condensers. *Ind. Eng. Chem. Res.*, 43(20), 6416–6429.
- Luyben, W.L. (2004) Design and control of refrigerated-purge distillation columns. *Ind. Eng. Chem. Res.*, 43(25), 8133–8140.

- Luyben, W.L. (2004) Design and control of distillation columns with intermediate reboilers. *Ind. Eng. Chem. Res.*, 43(26), 8244–8250.
- Luyben, W.L., Pszalgowski, K.M., Schaefer, M.R., and Siddons, C. (2004) Design and control of conventional and reactive distillation processes for the production of butyl acetate. *Ind. Eng. Chem. Res.*, 43(25), 8014–8025.
- Meili, A. (2004) Reduce energy costs for distillation column. *Hydrocarbon Process.*, 83(10), 101–103.
- Mengual, J.I., Khayet, M., and Godino, M.P. (2004) Heat and mass transfer in vacuum membrane distillation. *Int. J. Heat Mass Transfer*, 47(4), 865–875.
- Meukam, P., Njomo, D., and Gbane, A. (2004) Experimental optimization of a solar still: Application to alcohol distillation. *Chem. Eng. Process.*, 43(12), 1569–1577.
- Miladi, M.M., and Mujtaba, I.M. (2004) Optimisation of design and operation policies of binary batch distillation with fixed product demand. *Comput. Chem. Eng.*, 28(11), 2377–2390.
- Monroy-Loperena, R., and Alvarez-Ramirez, J. (2004) Some aspects of the operation of semi-continuous, middle vessel distillation columns. *Chem. Eng. Commun.*, 191(11), 1437–1455.
- Mortaheb, H.R., and Kosuge, H. (2004) Simulation and optimization of heterogeneous azeotropic distillation process with a rate-based model. *Chem. Eng. Process.*, 43(3), 317–326.
- Nava, J.A.O., and Krishna, R. (2004) Influence of unequal component efficiencies on trajectories during distillation of a homogeneous azeotropic mixture. *Chem. Eng. Process.*, 43(3), 305–316.
- Nisoli, A., Doherty, M.F., and Malone, M.F. (2004) Effects of vapor-liquid mass transfer on feasibility of reactive distillation. *AIChE J.*, 50(8), 1795–1813.
- Noeres, C., Dadhe, K., and Gesthuisen, R. (2004) Model-based design, control and optimisation of catalytic distillation processes. *Chem. Eng. Process.*, 43(3), 421–434.
- Ojeda Nava, J.A., Baur, R., and Krishna, R. (2004) Combining distillation and heterogeneous catalytic reactors. *Chem. Eng. Res. Des.*, 82(2), 160–166.
- Ouni, T., Jakobsson, K., and Pyhalähti, A. (2004) Enhancing productivity of side reactor configuration through optimizing the reaction conditions. *Chem. Eng. Res. Des.*, 82(2), 167–174.
- Prasad, T.E.V., Prasad, D.H.L., and Kalpana, T. (2004) Bubble temperatures of the binary mixtures of 1,2-dimethylbenzene with 2-propanol, 1-butanol,

- 2-butanol, 2-methylpropan-1-ol and 2-methylpropan-2-ol at 95 kPa. *Chem. Eng. Commun.*, 191(1), 17–26.
- Popken, T., and Gmehling, J. (2004) Simple method for determining the location of distillation region boundaries in quaternary systems. *Ind. Eng. Chem. Res.*, 43(3), 777–783.
- Qi, Z., Flockerzi, D., and Sundmacher, K. (2004) Singular points of reactive distillation systems. *AIChE J.*, 50(11), 2866–2876.
- Qi, Z., Kienle, A., and Stein, E. (2004) MTBE decomposition in a reactive distillation column. *Chem. Eng. Res. Des.*, 82(2), 185–191.
- Qi, Z., and Zhang, R. (2004) Alkylation of benzene with ethylene in a packed bed reactive distillation column. *Ind. Eng. Chem. Res.*, 43(15), 4105–4111.
- Raghunathan, A.U., Soledad Diaz, M., and Biegler, L.T. (2004) An MPEC formulation for dynamic optimization of distillation operations. *Comput. Chem. Eng.*, 28(10), 2037–2052.
- Ramirez, N., and Jimenez, A. (2004) Two alternatives to thermally coupled distillation systems with side columns. *AIChE J.*, 50(11), 2971–2975.
- Reepmeyer, F., Repke, J.U., and Wozny, G. (2004) Time optimal start-up strategies for reactive distillation columns. *Chem. Eng. Sci.*, 59(20), 4339–4347.
- Repke, J.U., Villian, O., and Wozny, G. (2004) A nonequilibrium model for three-phase distillation in a packed column: Modelling and experiments. *Comput. Chem. Eng.*, 28(5), 775–780.
- Repke, J.U., and Wozny, G. (2004) A short story of modeling and operation of three-phase distillation in packed columns. *Ind. Eng. Chem. Res.*, 43(24), 7850–7860.
- Rong, B.G., Kraslawski, A., and Turunen, I. (2004) Synthesis and optimal design of thermodynamically equivalent thermally coupled distillation systems. *Ind. Eng. Chem. Res.*, 43(18), 5904–5915.
- Rubbers, E., Green, K., Fowler, T., and Kister, H.Z. (2004) Distillation reboiler startup can pose challenges. *Chem. Eng. (N.Y.)*, 111(2), 55–60.
- Scenna, N.J., Benz, S.J., and Francesconi, J.A. (2004) Start-up of homogeneous azeotropic distillation columns with multiple steady states. *Ind. Eng. Chem. Res.*, 43(2), 553–565.
- Schmitt, M., Hasse, H., and Althaus, K. (2004) Synthesis of n-hexyl acetate by reactive distillation. *Chem. Eng. Process.*, 43(3), 397–409.
- Segovia-Hernandez, J.G., Hernandez, S., and Rico-Ramirez, V. (2004) A comparison of the feedback control behavior between thermally coupled

- and conventional distillation schemes. *Comput. Chem. Eng.*, 28(5), 811–819.
- Skouras, S., and Skogestad, S. (2004) Separation of ternary heteroazeotropic mixtures in a closed multivessel batch distillation-decanter hybrid. *Chem. Eng. Process.*, 43(3), 291–304.
- Skouras, S., and Skogestad, S. (2004) Time (energy) requirements in closed batch distillation arrangements. *Comput. Chem. Eng.*, 28(5), 829–837.
- Skouras, S., and Skogestad, S. (2004) Time requirements for heteroazeotropic distillation in batch columns. *Comput. Chem. Eng.*, 28(9), 1689–1700.
- Steinigeweg, S., and Gmehling, J. (2004) Transesterification processes by combination of reactive distillation and pervaporation. *Chem. Eng. Process.*, 43(3), 447–456.
- Szanyi, A., Mizsey, P., and Fonyo, Z. (2004) Novel hybrid separation processes for solvent recovery based on positioning the extractive heterogeneous-azeotropic distillation. *Chem. Eng. Process.*, 43(3), 327–338.
- Szanyi, A., Mizsey, P., and Fonyo, Z. (2004) Optimization of nonideal separation structures based on extractive heterogeneous azeotropic distillation. *Ind. Eng. Chem. Res.*, 43(26), 8269–8274.
- Tai, C.Y., and You, G.S. (2004) Fractionation of metal ions from water using supercritical carbon dioxide. *AIChE J.*, 50(7), 1627–1630.
- Taiwo, E.A., and Fasesan, S.O. (2004) Model for dynamic liquid hold-up in a packed distillation column. *Ind. Eng. Chem. Res.*, 43(1), 197–202.
- Taylor, M., and Wankat, P.C. (2004) Increasing the energy efficiency of extractive distillation. *Sep. Sci. Technol.*, 39(1), 1–17.
- Taylor, R., Baur, R., and Krishna, R. (2004) Influence of mass transfer in distillation: Residue curves and total reflux. *AIChE J.*, 50(12), 3134–3148.
- Thong, D.Y.C., Liu, G., and Jobson, M. (2004) Synthesis of distillation sequences for separating multicomponent azeotropic mixtures. *Chem. Eng. Process.*, 43(3), 239–250.
- Van Hoof, V., Van den Abeele, L., and Buekenhoudt, A. (2004) Economic comparison between azeotropic distillation and different hybrid systems combining distillation with pervaporation for the dehydration of isopropanol. *Sep. Purif. Technol.*, 37(1), 33–49.
- Wang, X.L., Liu, C.J., Yuan, G., and Yu, K.T. (2004) Computational fluid dynamics simulation of three-dimensional liquid flow and mass transfer on distillation column trays. *Ind. Eng. Chem. Res.*, 43(10), 2556–2567.
- Warter, M., Demicoli, D., and Stichlmair, J. (2004) Operation of a batch distillation column with a middle vessel: Experimental results for the

- separation of zeotropic and azeotropic mixtures. *Chem. Eng. Process.*, 43(3), 263–272.
- Wozny, G., and Li, P. (2004) Optimisation and experimental verification of startup policies for distillation columns. *Comput. Chem. Eng.*, 28(1), 253–265.
- Young, E., and Olson, J.A. (2004) Development of a continuous high-efficiency laboratory fibre fractionator. *Can. J. Chem. Eng.*, 82(3), 433–441.
- Zhang, L., and Linninger, A.A. (2004) Temperature collocation algorithm for fast and robust distillation design. *Ind. Eng. Chem. Res.*, 43(12), 3163–3182.
- Zheng, Y., Ng, F.T.T., and Rempel, G.L. (2004) A comparison of a pseudo-homogeneous non-equilibrium model and a three-phase non-equilibrium model for catalytic distillation. *Chem. Eng. J.*, 100(1), 119–127.

## COLUMN DESIGN DATA

- Akosman, C., and Walters, J.K. (2004) The role of axial dispersion in fixed beds of reacting solid particles. *Chem. Eng. Process.*, 43(2), 181–185.
- Akosman, C., Orhan, R., and Dursun, G. (2004) Effects of liquid property on gas holdup and mass transfer in co-current downflow contacting column. *Chem. Eng. Process.*, 43(4), 503–509.
- Akramov, T.A., Svoboda, P., and Jiricny, V. (2004) Mathematical analysis of the conditions necessary for the appearance of the “overshoot” phenomenon in countercurrent packed columns. *Ind. Eng. Chem. Res.*, 43(18), 5899–5903.
- Albusairi, B., and Hsu, J.T. (2004) Flow through beds of perfusive particles: Effective medium model for velocity prediction within the perfusive media. *Chem. Eng. J.*, 100(1), 79–84.
- Balhoff, M.T., and Thompson, K.E. (2004) Modeling the steady flow of yield-stress fluids in packed beds. *AIChE J.*, 50(12), 3034–3048.
- Bartelmus, G., and Janecki, D. (2004) Hydrodynamics of cocurrent downflow of gas and foaming liquid through a packed bed: Estimation of transition boundary between hydrodynamic regimes from gas continuous flow to pulsing flow. *Chem. Eng. Process.*, 43(2), 169–179.
- Bruce, A.E.R., Sai, P.S.T., and Krishnaiah, K. (2004) Liquid holdup in turbulent bed contactor. *Chem. Eng. J.*, 99(3), 203–212.
- Dhole, S.D., Chhabra, R.P., and Eswaran, V. (2004) Power law fluid flow through beds of spheres at intermediate Reynolds numbers: Pressure in fixed and distended beds. *Chem. Eng. Res. Des.*, 82(5), 642–652.

- Di Felice, R., and Gibilaro, L.G. (2004) Wall effects for the pressure drop in fixed beds. *Chem. Eng. Sci.*, 59(14), 3037–3040.
- Dudukovic, A.P., Nikacevic, N.M., and Kuzeljevic, Z.V. (2004) Modeling and predictions of solids dynamic holdup in gas-flowing solids-fixed bed contactors. *Ind. Eng. Chem. Res.*, 43(23), 7445–7448.
- Gostick, J., Pritzker, M., Lohi, A., and Doan, H.D. (2004) Mass transfer variation within a packed bed and its relation to liquid distribution, *Chem. Eng. J.*, 100(1), 33–41.
- Guardo, A., Coussirat, M., and Larrayoz, M.A. (2004) CFD flow and heat transfer in nonregular packings for fixed bed equipment design. *Ind. Eng. Chem. Res.*, 43(22), 7049–7056.
- Guedes de Carvalho, J.R.F., Delgado, J.M.P.Q., and Alves, M.A. (2004) Mass transfer between flowing fluid and sphere buried in packed bed of inerts. *AIChE J.*, 50(1), 65–74.
- Hadjiev, D., Limousy, L., and Sabiri, N.E. (2004) The design of separators based on phase inversion at low velocities in the nozzles. *Sep. Purif. Technol.*, 38(2), 181–189.
- Holland, S.T., Tapp, M., Hildebrandt, D., and Glasser, D. (2004) Column profile maps. 2. Singular points and phase diagram behaviour in ideal and nonideal systems. *Ind. Eng. Chem. Res.*, 43(14), 3590–3603.
- Huang, X., Varma, A., and McCreedy, M.J. (2004) Heat transfer characterization of gas-liquid flows in a trickle-bed. *Chem. Eng. Sci.*, 59(18), 3767–3776.
- Iliuta, I., Petre, C.F., and Larachi, F. (2004) Hydrodynamic continuum model for two-phase flow structured-packing-containing columns. *Chem. Eng. Sci.*, 59(4), 879–888.
- Khadiv-Parsi, P., and Moosavian, M.A. (2004) Suggestion of a new correlation for the height of shallow dispersion bed formed in a rotating disc contactor. *Can. J. Chem. Eng.*, 82(2), 256–264.
- Kolev, N., Razkazova-Velkova, E., and Lozanov, P. (2004) A new principle for creation of packings operating at extremely low liquid superficial velocity. *Chem. Eng. Process.*, 43(1), 1–7.
- Kolodziej, A., Jaroszynski, M., and Bylica, I. (2004) Mass transfer and hydraulics for KATAPAK-S. *Chem. Eng. Process.*, 43(3), 457–464.
- Li, X.M., Yu, X.M., and Yao, K.J. (2004) Dynamic seals on hanging downcomers. *Chem. Eng. Res. Des.*, 82(1), 18–24.
- Loimer, T., Machu, G., and Schaflinger, U. (2004) Inviscid bubble formation on porous plates and sieve plates. *Chem. Eng. Sci.*, 59(4), 809–818.

- Murrieta, C.R., Seibert, A.F., and Fair, J.R. (2004) Liquid-side mass-transfer resistance of structured packings. *Ind. Eng. Chem. Res.*, 43(22), 7113–7120.
- Nijemeisland, M., and Dixon, A.G. (2004) CFD study of fluid flow and wall heat transfer in a fixed bed of spheres. *AIChE J.*, 50(5), 906–921.
- Olujic, Z., Mohamed Ali, A., and Jansens, P.J. (2004) Effect of the initial gas maldistribution on the pressure drop of structured packings. *Chem. Eng. Process.*, 43(3), 465–476.
- Raynal, L., Ballaguet, J.P., and Barrere-Tricca, C. (2004) Determination of mass transfer characteristics of co-current two-phase flow within structured packing. *Chem. Eng. Sci.*, 59(22), 5395–5402.
- Raynal, L., Boyer, C., and Ballaguet, J.P. (2004) Liquid holdup and pressure drop determination in structured packing with CFD simulations. *Can. J. Chem. Eng.*, 82(5), 871–879.
- Sharma, R., Singh, K., Singhal, D., and Ghosh, R. (2004) Neural network applications for detecting process faults in packed towers. *Chem. Eng. Process.*, 43(7), 841–847.
- Slavin, A.J., Irvine, E., and Penson, S. (2004) Analytical model for the thermal conductivity of a binary bed of packed spheroids in the presence of a static gas, with no adjustable parameters provided contact conductance is negligible. *Int. J. Heat Mass Transfer*, 47(5), 1015–1021.
- Solcova, O., and Schneider, P. (2004) Axial dispersion in single pellet-string columns with non-porous packing. *Chem. Eng. Sci.*, 59(6), 1301–1307.
- Svoboda, P., and Stanek, V. (2004) Theoretical explanation of pressure and holdup overshoots in countercurrent packed-bed columns. *Ind. Eng. Chem. Res.*, 43(26), 8317–8322.
- Syeda, S.R., Afacan, A., and Chuang, K.T. (2004) Effect of surface tension gradient on froth stabilization and tray efficiency. *Chem. Eng. Res. Des.*, 82(6), 762–769.
- Tapp, M., Holland, S.T., Hildebrandt, D. and Glasser, D. (2004) Column profile maps. 1. Derivation and interpretation. *Ind. Eng. Chem. Res.*, 43(2), 364–374.
- van der Merwe, W., Maree, C., and Nicol, W. (2004) Nature of residual liquid holdup in packed beds of spherical particles. *Ind. Eng. Chem. Res.*, 43(26), 8363–8368.
- Yuan, Y., Han, M., Wang, D., and Jin, Y. (2004) Liquid phase residence time distribution for a two-phase countercurrent flow in a packed column with a novel internal. *Chem. Eng. Process.*, 43(12), 1469–1474.

- Yuna, Y., Han, M., and Wang, L. (2004) Mass transfer coefficient for two-phase countercurrent flow in a packed column with a novel internal. *Chem. Eng. J.*, 99(3), 273–277.
- Zhu, L., Yu, X., and Yao, K. (2004) Promotions for further improvements in multiple downcomer tray performance. *Ind. Eng. Chem. Res.*, 43(20), 6484–6489.

## ABSORPTION REACTIONS AND ABSORBER DESIGN, COOLING TOWERS

- Aboudheir, A., Tontiwachwuthikul, P., and Chakma, A. (2004) Novel design for the nozzle of a laminar jet absorber. *Ind. Eng. Chem. Res.*, 43(10), 2568–2574.
- Akbar, M.K., and Ghiaasiaan, S.M. (2004) Modeling the gas absorption in a spray scrubber with dissolving reactive particles. *Chem. Eng. Sci.*, 59(5), 967–976.
- Ali, S.H. (2004) Kinetic study of the reaction of diethanolamine with carbon dioxide in aqueous and mixed solvent systems: Application to acid gas cleaning. *Sep. Purif. Technol.*, 38(3), 281–296.
- Amararene, F., and Bouallou, C. (2004) Kinetics of carbonyl sulfide (COS) absorption solutions of diethanolamine and methyldiethanolamine. *Ind. Eng. Chem. Res.*, 43(19), 6136–6141.
- Aroonwilas, A., and Veawab, A. (2004) Characterization and comparison of the CO<sub>2</sub> absorption performance into single and blended alkanolamines in a packed column. *Ind. Eng. Chem. Res.*, 43(9), 2228–2237.
- Bolhar-Nordenkamp, M., Friedl, A., Koss, U., and Tork, T. (2004) Modelling selective H<sub>2</sub>S absorption and desorption in an aqueous MDEA-solution using a rate-based non-equilibrium approach. *Chem. Eng. Process.*, 43(6), 701–715.
- Brettschneider, O., Thiele, R., and Faber, R. (2004) Experimental investigation and simulation of the chemical absorption in a packed column for the system NH<sub>3</sub>–CO<sub>2</sub>–H<sub>2</sub>S–NaOH–H<sub>2</sub>O. *Sep. Purif. Technol.*, 39(3), 139–159.
- Butler, A.D., Fan, M., and Brown, R.C. (2004) Absorption of dilute SO<sub>2</sub> gas stream with conversion to polymeric ferric sulfate for use in water treatment. *Chem. Eng. J.*, 98(3), 265–273.
- Castro, J., Leal, L., Perez-Segarra, C.D., and Pozo, P. (2004) Numerical study of the enhancement produced in absorption processes using surfactants. *Int. J. Heat Mass Transfer*, 47(14), 3463–3476.

- Chung, J.B., and Chung, J.S. (2004) Removal of sulfur fume by reactive absorption using cobalt-containing absorbents. *Ind. Eng. Chem. Res.*, 43(17), 5318–5325.
- Cullinane, J.T., and Rochelle, G.T. (2004) Carbon dioxide absorption with aqueous potassium carbonate promoted by piperazine. *Chem. Eng. Sci.*, 59(17), 3619–3630.
- da Silva, E.F., and Svendsen, H.F. (2004) Ab initio study of the reaction of carbamate formation from CO<sub>2</sub> and alkanolamines. *Ind. Eng. Chem. Res.*, 43(13), 3413–3418.
- Daneshvar, N., and Moattar, M.T.Z. (2004) CO<sub>2</sub> equilibrium absorption in multicomponent systems (CO<sub>2</sub> + TIPA + MEA + H<sub>2</sub>O), (CO<sub>2</sub> + TIPA + Pz + H<sub>2</sub>O) and (CO<sub>2</sub> + TIPA + H<sub>2</sub>O) at low CO<sub>2</sub> partial pressures: Experimental solubility data, corrosion study and ANNs. *Sep. Purif. Technol.*, 37(2), 135–147.
- de Paiva, J.L., and Kachan, G.C. (2004) Absorption of nitrogen oxides in aqueous solutions in a structured packing pilot column. *Chem. Eng. Process.*, 43(7), 941–948.
- Dronen, L.C., Moore, A.E., Kozliak, E.I., and Seames, W.S. (2004) An assessment of acid wash and bioleaching pre-treating options to remove mercury from coal. *Fuel*, 83(2), 181–186.
- Elsarrag, E., Magzoub, E.E.M., and Jain, S. (2004) Mass-transfer correlations for dehumidification of air by triethylene glycol in a structured packed column. *Ind. Eng. Chem. Res.*, 43(23), 7676–7681.
- Fisenko, S.P., Brin, A.A., and Petruchik, A.I. (2004) Evaporative cooling of water in a mechanical draft cooling tower. *Int. J. Heat Mass Transfer*, 47(1), 165–177.
- Gomez-Diaz, D., and Navaza, J.M. (2004) Analysis of carbon dioxide gas/liquid mass transfer in aerated stirred vessels using non-Newtonian media. *J. Chem. Technol. Biotechnol.*, 79(10), 1105–1112.
- Hadjoudj, R., Monnier, H., Roizard, C., and Lapicque, F. (2004) Absorption of chlorinated VOCs in high-boiling solvents: Determination of Henry's Law constants and infinite dilution activity coefficients. *Ind. Eng. Chem. Res.*, 43(9), 2238–2246.
- Hardie, C.A., Gomez, C.O., and Finch, J.A. (2004) Comparison of internal and external mixer spargers in a laboratory de-inking flotation column. *Can. J. Chem. Eng.*, 82(3), 504–509.
- Hoff, K.A., Juliussen, O., and Falk-Pedersen, O. (2004) Modeling and experimental study of carbon dioxide absorption in aqueous alkanolamine solutions using a membrane contactor. *Ind. Eng. Chem. Res.*, 43(16), 4908–4921.

- Houzen, Z., Bingqing, L., and Hua, L. (2004) Thermodynamic analysis on pyrolusite-absorbing nitrogen oxides. *Ind. Eng. Chem. Res.*, 43(18), 5965–5968.
- Hupka, J., Miller, J.D., and Drelich, J. (2004) Water-based bitumen recovery from diluent-conditioned oil sands. *Can. J. Chem. Eng.*, 82(5), 978–985.
- Islam, M.R., Wijesundera, N.E., and Ho, J.C. (2004) Simplified models for coupled heat and mass transfer in falling-film absorbers. *Int. J. Heat Mass Transfer*, 47(2), 395–406.
- Killion, J.D., and Garimella, S. (2004) Pendant droplet motion for absorption on horizontal tube banks. *Int. J. Heat Mass Transfer*, 47(19), 4403–4414.
- Kim, J., Choi, C.K., and Kang, Y.T. (2004) Instability analysis of Marangoni convection for absorption process accompanied by heat transfer. *Int. J. Heat Mass Transfer*, 47(10), 2395–2402.
- Lelinski, D., Drelich, J., Miller, J.D., and Hupka, J. (2004) Rate of bitumen film transfer from a quartz surface to an air bubble as observed by optical microscopy. *Can. J. Chem. Eng.*, 82(4), 794–800.
- Li, Y., Wu, Y., and Gao, J. (2004) Study on a new type of HCl-removal agent for high-temperature cleaning of coal gas. *Ind. Eng. Chem. Res.*, 43(8), 1807–1811.
- Liu, C.Y., and Aika, K.I. (2004) Ammonia absorption into alkaline earth metal halide mixtures as an ammonia storage material. *Ind. Eng. Chem. Res.*, 43(23), 7484–7491.
- Lobo-Recio, M.A., Alguacil, F.J., and Lopez-Delgado, A. (2004) Processing of steel rinse waters through coextraction and selective stripping. *AIChE J.*, 50(6), 1150–1155.
- Mak, C., Cornu, E., Moresoli, C., and Chen, P. (2004) Surface tension, diffusion and kinetics studies of an air-stripping process. *Sep. Purif. Technol.*, 36(2), 95–106.
- Mandal, B.P., Biswas, A.K., and Bandyopadhyay, S.S. (2004) Selective absorption of  $H_2S$  from gas streams containing  $H_2S$  and  $CO_2$  into aqueous solutions of N-methyldiethanolamine and 2-amino-2-methyl-1-propanol. *Sep. Purif. Technol.*, 35(3), 191–202.
- McKenna, S.P., and McGillis, W.R. (2004) The role of free-surface turbulence and surfactants in air-water gas transfer. *Int. J. Heat Mass Transfer*, 47(3), 539–553.
- Meikap, B.C., and Biswas, M.N. (2004) Fly-ash removal efficiency in a modified multi-stage bubble column scrubber. *Sep. Purif. Technol.*, 36(3), 177–190.

- Moreira, M.F.P., Ferreira, M.C., and Freire, J.T. (2004) Total liquid saturation in gas-liquid cocurrent downflow and upflow through packed beds and analysis of correlations for predicting the total liquid saturation. *Ind. Eng. Chem. Res.*, 43(4), 1096–1102.
- Oliveira, M.S.N., and Ni, X.W. (2004) Effect of hydrodynamics on mass transfer in a gas-liquid oscillatory baffled column. *Chem. Eng. J.*, 99(1), 59–68.
- Park, A.H.A., and Fan, L.S. (2004) CO<sub>2</sub> mineral sequestration: Physically activated dissolution of serpentine and pH swing process. *Chem. Eng. Sci.*, 59(22), 5241–5247.
- Park, S.W., and Sohn, I.J. (2004) Absorption of carbon dioxide into non-Newtonian liquid. III. Effect of chemical reaction. *Sep. Sci. Technol.*, 39(10), 2323–2350.
- Rahimpour, M.R. (2004) A non-ideal rate-based model for industrial urea thermal hydrolyser. *Chem. Eng. Process.*, 43(10), 1299–1307.
- Rahimpour, M.R., and Kashkooli, A.Z. (2004) Enhanced carbon dioxide removal by promoted hot potassium carbonate in a split-flow absorber. *Chem. Eng. Process.*, 43(7), 857–865.
- Reine, T.A. Edwards, W.M., and Wang, B. (2004) Use of electrochemistry to predict ethylene absorption capacities of reactive absorption systems. *Ind. Eng. Chem. Res.*, 43(20), 6514–6520.
- Rendtorff Birrer, F.R., and Bohm, U. (2004) Gas-liquid dispersions in structured packing with high-viscosity liquids. *Chem. Eng. Sci.*, 59(20), 4385–4392.
- Rewatkar, V.B., and Bennington, C.P.J. (2004) Gas-liquid mass transfer in pulp retention towers. *Can. J. Chem. Eng.*, 82(3), 465–470.
- Roy, S., and Rochelle, G.T. (2004) Simultaneous absorption of mercury and chlorine in sulfite solutions. *Chem. Eng. Sci.*, 59(6), 1309–1323.
- Roy, S., and Rochelle, G.T. (2004) Chlorine absorption in sulfite solutions. *Sep. Sci. Technol.*, 39(13), 3057–3077.
- Sargent, A., and Seagraves, J. (2004) Improve acid-gas removal of LPG contactors. *Hydrocarbon Process.*, 83(1), 53–58.
- Sato, M., and Goto, M. (2004) Gas absorption in water with microchannel devices. *Sep. Sci. Technol.*, 39(13), 3163–3167.
- Say, R., Ersoz, A., Turk, H., and Denizli, A. (2004) Selective separation and preconcentration of cyanide by a column packed with cyanide-imprinted polymeric microbeads. *Sep. Purif. Technol.*, 40(1), 9–14.
- Smart, J.L. (2004) Using the evolutionary operation method to optimize gas absorber operation (a statistical method for process improvement). *Chem. Eng. Educ.*, 38(3), 204–211.

- Soto Frances, V.M., and Pinazo Ojer, J.M. (2004) Multi-factorial study of the absorption process of  $\text{H}_2\text{O}(\text{vap})$  by a  $\text{LiBr}(\text{aq})$  in a horizontal tube bundle using 2-ethyl-1-hexanol as surfactant. *Int. J. Heat Mass Transfer*, 47(14), 3355–3373.
- Tatani, A., Imai, T., and Fujima, Y. (2004) Effect of  $\text{Mn}^{2+}$  on sulfite oxidation in limestone scrubbing. *Energy Fuels*, 18(1), 54–62.
- Venegas, M., Izquierdo, M., and Rodriguez, P. (2004) Heat and mass transfer during absorption of ammonia vapour by  $\text{LiNO}_3\text{--NH}_3$  solution droplets. *Int. J. Heat Mass Transfer*, 47(12), 2653–2667.
- Vrachnos, A., Voutsas, E., and Magoulas, K. (2004) Thermodynamics of acid gas–MDEA–water systems. *Ind. Eng. Chem. Res.*, 43(11), 2798–2804.
- Wang, H., Dalla Lana, I.G., and Chuang, K.T. (2004) Mass-transfer characteristics for gas-liquid reaction of  $\text{H}_2\text{S}$  and sulfuric acid in a packed column. *Ind. Eng. Chem. Res.*, 43(18), 5846–5853.
- Wichert, E., and Wichert, G.C. (2004) New charts estimate acid gas solubility in TEG. *Hydrocarbon Process.*, 83(1), 47–48.

## LIQUID-LIQUID EXTRACTION

- Agulyansky, A., Agulyansky, L., and Travkin, V.F. (2004) Liquid-liquid extraction of tantalum with 2-octanol. *Chem. Eng. Process.*, 43(10), 1231–1237.
- Almela, A., Huebra, M., and Elizalde, M.P. (2004) Copper(II) extraction by 4-chloro-N-8-quinolinylbenzenesulfonamide dissolved in toluene. *J. Chem. Technol. Biotechnol.*, 79(3), 299–305.
- Apichaibukol, A., Sasaki, Y., and Morita, Y. (2004) Effect of DTPA on the extraction of actinides(III) and lanthanides(III) from nitrate solution into TODGA/n-dodecane. *Solvent Extr. Ion Exch.*, 22(6), 997–1011.
- Arce, A., Rodriguez, O., and Soto, A. (2004) Tert-amyl ethyl ether separation from its mixtures with ethanol using the 1-butyl-3-methylimidazolium trifluoromethanesulfonate ionic liquid: Liquid-liquid equilibrium. *Ind. Eng. Chem. Res.*, 43(26), 8323–8327.
- Arnold, J.M., and Otu, E.O. (2004) Effect of temperature on the synergistic extraction of some lanthanides by 2-ethylhexyl phenylphosphonic acid and micelles of dinonyl naphthalene sulfonic acid. *Solvent Extr. Ion Exch.*, 22(3), 415–428.
- Atanassova, M., and Dukov, I.L. (2004) Synergistic solvent extraction and separation of trivalent lanthanide metals with mixtures of 4-benzoyl-3-methyl-1-phenyl-2-pyrazolin-5-one and aliquat 336. *Sep. Purif. Technol.*, 40(2), 171–176.

- Attarakih, M.M., Bart, H.J., and Faqir, N.M. (2004) Solution of the droplet breakage equation for interacting liquid-liquid dispersions: A conservative discretization approach. *Chem. Eng. Sci.*, 59(12), 2547–2565.
- Attarakih, M.M., Bart, H.J., and Faqir, N.M. (2004) Numerical solution of the spatially distributed population balance equation describing the hydrodynamics of interacting liquid-liquid dispersions. *Chem. Eng. Sci.*, 59(12), 2567–2592.
- Bazelaire, E., Gorbunova, M.G., and Bonnesen, P.V. (2004) pH-switchable cesium nitrate extraction with calix[4]arene mono and bis(benzo-crown-6) ethers bearing amino functionalities. *Solvent Extr. Ion Exch.*, 22(4), 637–661.
- Belair, S., Lamouroux, C., and Tabarant, M. (2004) Modeling of the extraction of lanthanide nitrates from aqueous solutions over a wide range of activities by CMPO. *Solvent Extr. Ion Exch.*, 22(5), 791–811.
- Benguerel, E., and Demopoulos, G.P. (2004) Stripping of Rh-Sn-Cl-loaded alkylated 8-hydroxyquinoline with  $\text{Na}_2\text{SO}_3\text{--HCl}$ . *J. Chem. Technol. Biotechnol.*, 79(2), 187–194.
- Bhattacharyya, A., Mohapatra, P.K., and Banerjee, S. (2004) Role of ligand structure and basicity on the extraction of uranyl isoxazolonate adducts. *Solvent Extr. Ion Exch.*, 22(1), 13–30.
- Bleier, J., Syddall, M., Lyddiatt, A., and Chen, X.D. (2004) Two-stage aqueous two-phase extractions: Selection of system composition using a genetic algorithm. *Biochem. Eng. J.*, 21(3), 199–205.
- Borowiak-Resterna, A., and Lenarcik, B. (2004) Effect of the alkyl chain length in N,N-dialkylpyridine-3-carboxamides upon their extraction of copper(II) from aqueous chloride solutions. *Solvent Extr. Ion Exch.*, 22(6), 913–931.
- Califano, F., and Mauri, R. (2004) Drop size evolution during the phase separation of liquid mixtures. *Ind. Eng. Chem. Res.*, 43(2), 349–353.
- Canari, R., and Eyal, A.M. (2004) Temperature effect on the extraction of carboxylic acids by amine-based extractants. *Ind. Eng. Chem. Res.*, 43(23), 7608–7617.
- Chiarizia, R., Jensen, M.P., and Borkowski, M. (2004) Interpretation of third phase formation in the Th(VI)– $\text{HNO}_3$ , TBP-n-octane system with Baxter's "sticky spheres" model. *Solvent Extr. Ion Exch.*, 22(3), 325–351.
- Choung, J., Walker, J., Xu, Z., and Masliyah, J. (2004) Effect of temperature on the stability of froth formed in the recycle process water of oil sands extraction. *Can. J. Chem. Eng.*, 82(4), 801–806.

- Costa, M.C., Martins, M., and Paiva, A.P. (2004) Solvent extraction of iron(III) from acidic chloride media using N,N-dimethyl-N,N-dibutylmalonamide. *Sep. Sci. Technol.*, 39(15), 3573–3599.
- de Preez, J., McClelland, C.W., and Viviers, C. (2004) The separation of rhodium and iridium. III. Secondary reactions relating to chlorination. *Solvent Extr. Ion Exch.*, 22(2), 189–201.
- de Preez, J., Viviers, C., and Louw, T. (2004) The separation of rhodium and iridium. II. Chloridation and chlorination of iridium(III) and (IV). *Solvent Extr. Ion Exch.*, 22(2), 175–188.
- Draa, M.T., Belaid, T., and Benamor, M. (2004) Extraction of Pb(II) by XAD7 impregnated resins with organophosphorus extractants (DEHPA, IONQUEST 801, CYANEX 272). *Sep. Purif. Technol.*, 40(1), 77–86.
- Dukov, I.L., and Atanassova, M. (2004) Synergistic solvent extraction and separation of lanthanides using mixtures of 1-phenyl-3-methyl-4-benzoyl-pyrazol-5-one and aliquat-336: Influence of the ammonium salt anion. *Sep. Sci. Technol.*, 39(1), 227–239.
- Eksangsri, T., Habaki, H., and Kawasaki, J. (2004) Extraction of compactin (ML-236B): Equilibrium distribution in water–ethyl acetate system. *Chem. Eng. Process.*, 43(10), 1203–1210.
- Engle, N.L., Bonnesen, P.V., and Tomkins, B.A. (2004) Synthesis and properties of calix[4]arene-bis[4-(2-ethylhexyl)benzo-crown-6]; a cesium extractant with improved solubility. *Solvent Extr. Ion Exch.*, 22(4), 611–636.
- Escobar, A., Schimmel, K.A., and de Gyves, J. (2004) Hollow-fiber dispersion-free extraction and stripping of Pb(II) in the presence of Cd(II) using D2EHPA under recirculating operation mode. *J. Chem. Technol. Biotechnol.*, 79(9), 961–973.
- Feng, J., Li, W.Y., and Xie, K.C. (2004) Analysis of small molecular phase in coal involved in pyrolysis and solvent extraction of PGC. *Energy Fuels*, 18(3), 889–895.
- Glatz, D., and Parker, W. (2004) Enriching liquid-liquid extraction. *Chem. Eng. (N.Y.)*, 111(12), 44–48.
- Gomes, L.N., Guimaraes, M.L., and Lopes, J.C. (2004) Reproducibility of the hydrodynamic performance and measurements in a liquid-liquid Kuhni extraction column: Relevance to theoretical model evaluation. *Ind. Eng. Chem. Res.*, 43(4), 1061–1070.
- Goodson, M., and Kraft, M. (2004) Simulation of coalescence and breakage: An assessment of two stochastic methods suitable for simulating liquid-liquid extraction. *Chem. Eng. Sci.*, 59(18), 3865–3881.

- Griffin, G.J., and Shu, L. (2004) Solvent extraction and purification of sugars from hemicellulose hydrolysates using boronic acid carriers. *J. Chem. Technol. Biotechnol.*, 79(5), 505–511.
- Haddaoui, J., Trebouet, D., Loureiro, J.M., and Burgard, M. (2004) Non-dispersive solvent extraction of alkali metals with the dicylohexano 18 Crown 6: Evaluation of mass transfer coefficients. *Sep. Sci. Technol.*, 39(16), 3839–3858.
- Huff, M.M., and Otu, E.O. (2004) Thermodynamics of the extraction of lead, copper, cadmium, cobalt, and nickel with mono-2-ethylhexyl phosphoric acid. *Solvent Extr. Ion Exch.*, 22(4), 695–712.
- Hume, A.P., Petera, J., and Weatherley, L.R. (2004) Trajectories of charged drops in a liquid-liquid system: The effect of geometrical scale-up. *Ind. Eng. Chem. Res.*, 43(9), 2264–2270.
- Inoue, S., Zhang, Q., and Uto, M. (2004) Solvent extraction of lanthanides(III) with N-p-phenylbenzoyl-N-phenylhydroxylamine. *Solvent Extr. Ion Exch.*, 22(1), 121–133.
- Inoue, S., Zhang, Q., Uto, M., and Minami, H. (2004) Solvent extraction of lanthanides(III) with N-cinnamoyl-N-phenylhydroxylamine and its trifluoromethyl derivative. *Solvent Extr. Ion Exch.*, 22(4), 599–610.
- Ismail, A.S. (2004) Holdup profile in multistage stirred-cell liquid-liquid extraction column using population balance model. *Can. J. Chem. Eng.*, 82(5), 1037–1043.
- Jia, Q., Shang, Q., and Zhou, W. (2004) Synergistic extraction of lanthanum(III) from a nitrate medium by mixtures of 1-phenyl-3-methyl-4-benzoyl-pyrazalone-5 and triisobutylphosphine sulfide. *Ind. Eng. Chem. Res.*, 43(21), 6703–6707.
- Jia, Q., Zhan, C., and Li, D. (2004) Extraction of zinc(II) and cadmium(II) by using mixtures of primary amine N1923 and organophosphorus acids. *Sep. Sci. Technol.*, 39(5), 1111–1123.
- Jin, C.M., Lu, X.F., Lu, G.Y., Li, Y., and You, X.Z. (2004) Liquid-liquid extraction of alkali metal cations by calix[4] crowns with pendant groups. *Solvent Extr. Ion Exch.*, 22(4), 681–693.
- Karakaplan, M., Tural, S., and Tural, B. (2004) The solvent extraction of boron with synthesized aliphatic 1,3-diols: Stripping and extraction behavior of boron by 2,2,5-trimethyl-1,3-hexanediol. *Solvent Extr. Ion Exch.*, 22(6), 897–911.
- Kinoshita, T., Akita, S., and Nii, S. (2004) Solvent extraction of gallium with non-ionic surfactants from hydrochloric acid solution and its application to metal recovery from zinc refinery residues. *Sep. Purif. Technol.*, 37(2), 127–133.

- Koparkar, Y.P., and Gaikar, V.G. (2004) Hydrotropic separation of mixtures of o-/p-hydroxyacetophenones. *Sep. Sci. Technol.*, 39(16), 3879–3895.
- Kuzmanovic, B., Kuipers, N.J.M., de Haan, A.B., and Kwant, G. (2004) Reactive extraction of alcohols from apolar hydrocarbons with aqueous solutions. *Ind. Eng. Chem. Res.*, 43(23), 7572–7580.
- Kyuchoukov, G., Marinova, M., and Albet, J. (2004) New method for the extraction of lactic acid by means of a modified extractant (Aliquat 336), *Ind. Eng. Chem. Res.*, 43(5), 1179–1184.
- Lenarcik, B., and Kierzkowska, A. (2004) The influence of alkyl chain length and steric effect on stability constants and extractability of Zn(II) complexes with 1-alkyl-4(5)-methylimidazoles. *Sep. Sci. Technol.*, 39(15), 3485–3508.
- Lenarcik, B., and Kierzkowska, A. (2004) The influence of alkyl chain length on stability constants of Zn(II) complexes with 1-alkylimidazoles in aqueous solutions and their partition between aqueous phase and organic solvent. *Solvent Extr. Ion Exch.*, 22(3), 449–471.
- Lenarcik, B., and Ojczenasz, P. (2004) Investigation of the stability of Co(II) complexes with a homologous series of 1-alkylimidazoles in aqueous solution by using a partition method with several solvents. *Sep. Sci. Technol.*, 39(1), 199–226.
- Lenarcik, B., and Rauckyte, T. (2004) The influence of alkyl chain length on extraction equilibria of Ni(II) complexes with 1-alkylimidazoles in aqueous solution/organic solvent systems. *Sep. Sci. Technol.*, 39(14), 3353–3372.
- Li, H., Tang, X., Lou, G., and Wang, J. (2004) Development of two-point dynamic method for evaluating extraction columns. *Can. J. Chem. Eng.*, 82(3), 471–477.
- Liao, B.Q., Wan, C.R., and Wang, J. (2004) A concept for the estimation of HETS for rare earth separations in extraction columns. *Sep. Sci. Technol.*, 39(11), 2597–2607.
- Liu, X., Liang, J., and Xu, J. (2004) Simplified Chinese TRPO process to extract and recover transuranium elements from high-level liquid waste. *Solvent Extr. Ion Exch.*, 22(2), 163–173.
- Long, Y., Dabros, T., and Hamza, H. (2004) Analysis of solvent-diluted bitumen from oil sands froth treatment using NIR spectroscopy. *Can. J. Chem. Eng.*, 82(4), 776–781.
- Luo, G.S., Li, H.B., Yang, X.J., and Wang, J.D. (2004) Drop breakage in a coalescence-dispersion pulsed-sieve-plate extraction column. *Chem. Eng. J.*, 102(2), 185–191.

- Luthra, M., Lopetinsky, R.J.G., and Sanders, R.S. (2004) A new device to determine bitumen extraction from oil sands. *Can. J. Chem. Eng.*, 82(4), 752–762.
- Ma, M., Shen, A.H., and Luo, X.B. (2004) Solvent extraction and liquid-membrane transport for separation and purification of rutaecarpine from *E. rutaecarpa* var. *officinalis*. *Solvent Extr. Ion Exch.*, 22(3), 511–525.
- Ma, Z., Yan, T., and Wang, L. (2004) Gas-agitated liquid and oxidative extraction in the alkyl anthraquinone process for the preparation of hydrogen peroxide. *Chem. Eng. Commun.*, 191(12), 1554–1563.
- Manchanda, V.K., and Pathak, P.N. (2004) Amides and diamides as promising extractants in the back end of the nuclear fuel cycle: An overview. *Sep. Purif. Technol.*, 35(2), 85–103.
- Manchanda, V.K., Pathak, P.N., and Rao, A.K. (2004) Di(2-ethylhexyl) pivalamide (D2EHPVA): A promising extractant for selective removal of uranium from high level nuclear waste solutions. *Solvent Extr. Ion Exch.*, 22(3), 353–375.
- Mandal, D.K., Bhattacharya, B., and Das, R.D. (2004) Recovery of tellurium from chloride media using tri-iso-octylamine. *Sep. Purif. Technol.*, 40(2), 177–182.
- Mandal, D.K., Bhattacharya, B., and Das, R.D. (2004) Thermodynamics of extraction of selenium by tri-iso-octyl amine (TIOA) from chloride medium. *Sep. Sci. Technol.*, 39(9), 2207–2221.
- Mao, Z.S., and Chen, J. (2004) Numerical simulation of the Marangoni effect on mass transfer to single slowly moving drops in the liquid-liquid system. *Chem. Eng. Sci.*, 59(8), 1815–1828.
- Marinova, M., Kyuchoukov, G., and Albet, J. (2004) Separation of tartaric and lactic acids by means of solvent extraction. *Sep. Purif. Technol.*, 37(3), 199–207.
- Masliyah, J., Zhou, Z., and Xu, Z. (2004) Understanding water-based bitumen extraction from Athabasca oil sands. *Can. J. Chem. Eng.*, 82(4), 628–654.
- Meera, R., and Reddy, M. (2004) Para-substituted 1-phenyl-3-methyl-4-aryl-5-pyrazolones as chelating agents for the synergistic extraction of thorium(IV) and uranium(VI) in the presence of various crown ethers. *Solvent Extr. Ion Exch.*, 22(5), 761–789.
- Meure, L.A., Warwick, B., and Dehghani, F. (2004) Increasing copper indomethacin solubility by coprecipitation with poly(vinylpyrrolidone) using the aerosol solvent extraction system. *Ind. Eng. Chem. Res.*, 43(4), 1103–1112.
- Mishonov, I.V., Alejski, K., and Szymanowski, J. (2004) A contributive study on the stripping of zinc(II) from loaded TBP using an ammonia-ammonium chloride solution. *Solvent Extr. Ion Exch.*, 22(2), 219–241.

- Narita, H., Yaita, T., and Tachimori, S. (2004) Extraction of lanthanides with N,N-dimethyl-N,N-diphenyl-malonamide and -3,6-dioxaoctanediamide. *Solvent Extr. Ion Exch.*, 22(2), 135–145.
- Nave, S., Modolo, G., Madic, C., and Testard, F. (2004) Aggregation properties of N,N,N,N-tetraoctyl-3-oxapentanediamide (TODGA) in n-dodecane. *Solvent Extr. Ion Exch.*, 22(4), 527–551.
- Nikhade, B.P., Moulijn, J.A., and Pangarkar, V.G. (2004) Extraction of citric acid from aqueous solutions with Alamine 336: Equilibrium and kinetics. *J. Chem. Technol. Biotechnol.*, 79(10), 1155–1161.
- Nishihama, S., Nishimura, G., and Hirai, T. (2004) Separation and recovery of Cr(VI) from simulated plating waste using microcapsules containing quaternary ammonium salt extractant and phosphoric acid extractant. *Ind. Eng. Chem. Res.*, 43(3), 751–757.
- Ocio, A., Almela, A., and Elizalde, M.P. (2004) Cadmium(II) extraction from phosphoric media by bis(2,4,4-trimethylpentyl) dithiophosphinic acid (Cyanex 301). *Solvent Extr. Ion Exch.*, 22(6), 961–977.
- Okubo, Y., Toma, M., and Ueda, H. (2004) Microchannel devices for the coalescence of dispersed droplets produced for use in rapid extraction processes. *Chem. Eng. J.*, 101(1), 39–48.
- Ortiz, I., Bringas, E., and San Roman, M.F. (2004) Selective separation of zinc and iron from spent pickling solutions by membrane-based solvent extraction: Process viability. *Sep. Sci. Technol.*, 39(10), 2441–2455.
- Pandit, P., and Basu, S. (2004) Dye and solvent recovery in solvent extraction using reverse micelles for the removal of ionic dyes. *Ind. Eng. Chem. Res.*, 43(24), 7861–7864.
- Papadopoulos, A.I., and Linke, P. (2004) On the synthesis and optimization of liquid-liquid extraction processes using stochastic search methods. *Comput. Chem. Eng.*, 28(11), 2391–2406.
- Prochazka, J., Heyberger, A., and Volaufova, E. (2004) Extraction equilibrium of dicarboxylic acids with tertiary amine in single and binary diluents. *Sep. Sci. Technol.*, 39(5), 1073–1091.
- Reddy, B.R., Kumar, J.R., and Reddy, A.V. (2004) Solvent extraction of zirconium(IV) from acidic chloride solutions using the thiosubstituted organophosphorus acids Cyanex 301 and 302. *J. Chem. Technol. Biotechnol.*, 79(11), 1301–1307.
- Reis, M.T.A., and Carvalho, J. (2004) Kinetic studies of zinc extraction from sulfate solutions with bis(2-ethylhexyl) thiophosphoric acid. *Sep. Sci. Technol.*, 39(10), 2457–2475.

- Remya, P.N., and Reddy, M.L. (2004) Solvent extraction separation of titanium(IV), vanadium(V) and iron(III) from simulated waste chloride liquors of titanium minerals processing industry by the trialkylphosphine oxide Cyanex 923. *J. Chem. Technol. Biotechnol.*, 79(7), 734–741.
- Remya, P.N., Pavithran, R., and Reddy, M. (2004) 3-Phenyl-4-acyl-5-isoxazolones as reagents for the solvent extraction separation of titanium(IV) and iron(III) from multivalent metal chloride solutions. *Solvent Extr. Ion Exch.*, 22(3), 473–490.
- Ribeiro, M.M.M., Guimaraes, M.M.L., and Madureira, C.M.N. Non-invasive system and procedures for the characterization of liquid-liquid dispersions. *Chem. Eng. J.*, 97(2), 173–182 (2004).
- Rosinda, M., Ismael, C., and Lurdes, M. (2004) Extraction equilibrium of copper from ammoniacal media with LIX 54. *Sep. Sci. Technol.*, 39(16), 3859–3877.
- Sakanishi, K., Akashi, E., and Nakazato, T. (2004) Characterization of eluted metal components from coal during pretreatment and solvent extraction. *Fuel*, 83(6), 739–743.
- Sanpui, D., Singh, M.K., and Khanna, A. (2004) Rate-based non-isothermal LLX model and its experimental validation. *AIChE J.*, 50(2), 368–381.
- Sastre, A.M., and Szymanowski, J. (2004) Discussion of the physicochemical effects of modifiers on the extraction properties of hydroxyoximes: A review. *Solvent Extr. Ion Exch.*, 22(5), 737–759.
- Sastre, A.M., Kumar, A., and Alguacil, F.J. (2004) Solvent extraction of silver by LIX-79: Experimental equilibrium study. *J. Chem. Technol. Biotechnol.*, 79(3), 306–310.
- Schlieper, L., Chatterjee, M., Henschke, M., and Pfennig, A. (2004) Liquid-liquid phase separation in gravity settler with inclined plates. *AIChE J.*, 50(4), 802–811.
- Schneider, D.F. (2004) Avoid sulfolane regeneration problems. *Chem. Eng. Prog.*, 100(7), 34–39.
- Schulz, P., Dalix, L., Letoffe, J.M., and Faure, Y. (2004) INSEDEL: Method of studying separation in liquid-liquid phase application to water-diesel fuel emissions. *Fuel*, 83(1), 137–142.
- Senol, A. (2004) Effect of diluent on amine extraction of acetic acid: Modeling considerations. *Ind. Eng. Chem. Res.*, 43(20), 6496–6506.
- Senol, A. (2004) Amine extraction of chromium(VI) from aqueous acidic solutions. *Sep. Purif. Technol.*, 36(1), 63–75.

- Shimada, A., Yaita, T., and Narita, H. (2004) Extraction studies of lanthanide(III) ions with N,N-dimethyl-N,N-diphenylpyridine-2,6, dicarboxamide (DMDPhPDA) from nitric acid solutions. *Solvent Extr. Ion Exch.*, 22(2), 147–161.
- Shin, Y.O., and Vera, J.H. (2004) Reverse micellar extraction of lysozyme using two dialkyl sodium phosphinates. *Can. J. Chem. Eng.*, 82(2), 349–357.
- Shin, Y.O., Rodil, E., and Vera, J.H. (2004) Precipitation and recovery of Cytochrome-c and hemoglobin using AOT and acetone. *Sep. Sci. Technol.*, 39(5), 1005–1019.
- Slavtchev, S., and Mendes, M.A. (2004) Marangoni instability in binary liquid-liquid systems. *Int. J. Heat Mass Transfer*, 47(14), 3269–3278.
- Sparfel, D., and Cote, G. (2004) Synthesis and properties of new highly hydrophobic 7-substituted 8-quinolinols. *Solvent Extr. Ion Exch.*, 22(1), 1–12.
- Stepinski, D.C., McAlister, D.R., and Zalupski, P.R. (2004) An investigation of ester group steric effects on metal ion extraction by symmetrically substituted methylenediphosphonic acids. *Solvent Extr. Ion Exch.*, 22(1), 89–104.
- Suresh, A., Srinivasan, T.G., and Rao, P.R.V. (2004) U/Th separation by counter-current liquid-liquid extraction with tri-sec butyl phosphate by using an ejector mixer-settler. *Sep. Sci. Technol.*, 39(10), 2477–2496.
- Syzova, N., Eyal, A.M., and Vitner, A. (2004) Interactions between the components of ABC extractants and extraction of monocarboxylic acids by these extractants. *Solvent Extr. Ion Exch.*, 22(1), 31–50.
- Syzova, N., Eyal, A.M., and Vitner, A. (2004) Extraction of dicarboxylic acids by ABC extractants. *Solvent Extr. Ion Exch.*, 22(1), 51–68.
- Syzova, N., Eyal, A.M., Vitner, A., and Hazan, B. (2004) Extraction of carboxylic acids by ABC extractants: Effects of temperature, the polarity of the diluent, and the ratio between extractant components. *Solvent Extr. Ion Exch.*, 22(1), 69–88.
- Takeshita, K., Watanabe, K., and Nakano, Y. (2004) Extraction separation of Cd(II) and Zn(II) with Cyanex 301 and aqueous nitrogen-donor ligand TPEN. *Solvent Extr. Ion Exch.*, 22(2), 203–218.
- Tang, X., Luo, G., and Wang, J. (2004) A dynamic forward mixing model for evaluating the mass transfer performances of an extraction column. *Chem. Eng. Sci.*, 59(21), 4457–4466.
- Thomas, J., Surender, G.D., and Reddy, M. (2004) Preparation of hematite powders with plate-like morphology from titania wastes by solvent extraction followed by precipitation stripping and hydrothermal synthesis. *Sep. Sci. Technol.*, 39(7), 1695–1715.

- Turanov, A.N., Karandashev, V.K., and Yarkevich, A.N. (2004) Extraction of U(VI), Th(IV), Sc(III), and rare earth elements from nitric acid solutions by selected bifunctional neutral organophosphorus compounds. *Solvent Extr. Ion Exch.*, 22(3), 391–413.
- Turanov, A.N., Karandashev, V.K., and Yarkevich, A.N. (2004) Extraction of rare-earth elements from nitric acid solutions by selected bifunctional acidic organophosphorus compounds. *Solvent Extr. Ion Exch.*, 22(4), 573–598.
- Uheida, A., Zhang, Y., and Muhammed, M. (2004) Thermodynamic modeling of extraction equilibria of platinum and palladium with nonylthiourea from hydrochloric acid media. *Sep. Sci. Technol.*, 39(15), 3665–3677.
- Veeck, A.C., White, D.J., and Whisenhunt, D.W. (2004) Hydroxypyridinone extraction agents for Pu(IV). *Solvent Extr. Ion Exch.*, 22(6), 1037–1068.
- Veloso, G.O., Krioukov, V.G., and Vielmo, H.A. (2004) Mathematical modeling of vegetable oil extraction in a counter-current crossed flow horizontal extractor. *J. Food Eng.*, 66(4), 477–486.
- Venkateswaran, P., and Palanivelu, K. (2004) Solvent extraction of hexavalent chromium with tetrabutyl ammonium bromide from aqueous solution. *Sep. Purif. Technol.*, 40(3), 279–284.
- Wallace, D., Tipman, R., and Komishke, B. (2004) Fines/water interactions and consequences of the presence of degraded illite on oil sands extractability. *Can. J. Chem. Eng.*, 82(4), 667–677.
- Wallwork, V., Xu, Z., and Masliyah, J. (2004) Processibility of Athabasca oil sand using a laboratory hydrotransport extraction system. *Can. J. Chem. Eng.*, 82(4), 687–695.
- Wang, M., Qin, W., and Dai, Y. (2004) Extraction mechanism and behavior of malic acid with tri-octylamine (TOA). *Sep. Sci. Technol.*, 39(1), 185–198.
- Wasewar, K.L., Heesink, A.B.M., and Versteeg, G.F. (2004) Intensification of conversion of glucose to lactic acid: Equilibria and kinetics for back extraction of lactic acid using trimethylamine. *Chem. Eng. Sci.*, 59(11), 2315–2320.
- Watanabe, M., Mirvaliev, R., and Tachimori, S. (2004) Selective extraction of americium(III) over macroscopic concentration of lanthanides(III) by synergistic system of TPEN and D2EHPA in 1-octanol. *Solvent Extr. Ion Exch.*, 22(3), 377–390.
- Xiong, J., and Zhang, L. (2004) Effects of gas-agitation and packing on hydrodynamics and mass transfer of extraction column. *Can. J. Chem. Eng.*, 82(5), 1076–1080.

- Xiong, Y., Wang, Y.G., and Li, D.Q. (2004) Kinetics of extraction and stripping of Y(III) by Cyanex 272 as an acidic extractant using a constant interfacial cell with laminar flow. *Solvent Extr. Ion Exch.*, 22(5), 833–851.
- Yaita, T., Herlinger, A.W., and Thiagarajan, P. (2004) Influence of extractant aggregation on the extraction of trivalent f-element cations by a tetraalkyldiglycolamide. *Solvent Extr. Ion Exch.*, 22(4), 553–571.
- Zamani, A.A., and Yafian, M.R. (2004) Solvent extraction of thorium, lanthanum and europium ions by bis(2-ethylhexyl)-phosphoric acid using 2-nitrobenzo-18-crown-6 as ion size selective masking agent. *Sep. Purif. Technol.*, 40(2), 115–121.
- Zhang, P., Kimura, T., and Yoshida, Z. (2004) Luminescence study on the inner-sphere hydration number of lanthanide(III) ions in neutral organophosphorus complexes. *Solvent Extr. Ion Exch.*, 22(6), 933–945.
- Zhao, J., Meng, S., and Li, D. (2004) Liquid-liquid extraction of cerium(IV) from nitric acid media by di-(2-ethylhexyl) 2-ethylhexyl phosphonate (DEHEHP). *Solvent Extr. Ion Exch.*, 22(3), 429–447.
- Zhao, J., Meng, S., and Li, D. (2004) Coordination reactions in the extraction of cerium(IV) and fluorine(I) by DEHEHP from mixed nitric acid and hydrofluoric acid solutions. *Solvent Extr. Ion Exch.*, 22(5), 813–831.
- Zhivkova, S., Dimitrov, K., and Kyuchoukov, G. (2004) Separation of zinc and iron by pertraction in rotating film contactor with Kelex 100 as a carrier. *Sep. Purif. Technol.*, 37(1), 9–16.
- Zhou, Z., Kasongo, T., Xu, Z., and Masliyah, J. (2004) Assessment of bitumen recovery from the Athabasca oil sands using a laboratory Denver flotation cell. *Can. J. Chem. Eng.*, 82(4), 696–703.
- Zou, X.Y., Dukhedine-Lalla, L., Zhang, X., and Shaw, J.M. (2004) Selective rejection of inorganic fine solids, heavy metals, and sulfur from heavy oils/bitumen using alkane solvents. *Ind. Eng. Chem. Res.*, 43(22), 7103–7112.

## SUPERCritical EXTRACTION

- Bauza, R., Rios, A., and Valcarcel, M. (2004) Enantioselective supercritical fluid extraction from racemic mixtures by use of chiral selectors. *Sep. Sci. Technol.*, 39(2), 459–478.
- Kersch, C., Woerlee, G.F., and Witkamp, G.J. (2004) Supercritical fluid extraction of heavy metals from fly ash. *Ind. Eng. Chem. Res.*, 43(1), 190–196.
- McAlister, D.R., Dietz, M.L., and Stepinski, D. (2004) Application of molecular connectivity indices to design of supercritical carbon

- dioxide-soluble metal ion extractants: SC-CO<sub>2</sub> solubilities of symmetrically substituted alkylenediphosphonic acids. *Sep. Sci. Technol.*, 39(4), 761–780.
- Mendes, R.L., Reis, A.D., and Pereira, A.P. (2004) Supercritical CO<sub>2</sub> extraction of alpha-linolenic acid (GLA) from the cyanobacterium *Arthrospira* (*Spirulina*) *maxima*: Experiments and modeling. *Chem. Eng. J.*, 105(3), 147–151.
- Norulaini, A.N.N., Zaidul, I.S.M., and Anuar, O. (2004) Supercritical enhancement for separation of lauric acid and oleic acid in palm kernel oil (PKO). *Sep. Purif. Technol.*, 35(1), 55–60.
- Norulaini, A.N.N., Zaidul, I.S.M., and Anuar, O. (2004) Supercritical enhancement for separation of lauric acid and oleic acid in palm kernel oil (PKO). *Sep. Purif. Technol.*, 39(3), 133–138.

## REFERENCES

1. Ray, M.S. (2005) Equilibrium-staged separations: A bibliography update (2003). *Sep. Sci. Technol.*, 40 (5): 1145–1168.
2. Ray, M.S. (2004) Equilibrium-staged separations: A bibliography update (2002). *Sep. Sci. Technol.*, 39 (3): 709–740.
3. Ray, M.S. (2003) Equilibrium-staged separations: A bibliography update (2001). *Sep. Sci. Technol.*, 38 (6): 1437–1461.
4. Ray, M.S. (2002) Equilibrium-staged separations: A bibliography update (2000). *Sep. Sci. Technol.*, 37 (10): 2477–2504.
5. Ray, M.S. (2000) Equilibrium-staged separations: A bibliography update (1999). *Sep. Sci. Technol.*, 35 (16): 2675–2781.
6. Ray, M.S. (1999) Equilibrium-staged separations: A bibliography update (1998). *Sep. Sci. Technol.*, 34 (16): 3305–3321.
7. Ray, M.S. (1999) Equilibrium-staged separations: A bibliography update (1997). *Sep. Sci. Technol.*, 34 (1): 139–156.
8. Ray, M.S. (1997) Equilibrium-staged separations: A bibliography update (1996). *Sep. Sci. Technol.*, 32 (18): 3067–3083.
9. Ray, M.S. (1997) Equilibrium-staged separations: A bibliography update (1995). *Sep. Sci. Technol.*, 32 (7): 1163–1187.
10. Ray, M.S. (1995) Equilibrium-staged separations: A bibliography update (1994). *Sep. Sci. Technol.*, 30 (20): 3723–3745.
11. Ray, M.S. (1994) Equilibrium-staged separations: A bibliography update (1992–1993). *Sep. Sci. Technol.*, 29 (17): 2359–2385.
12. Ray, M.S. (1993) Equilibrium-staged separations: A bibliography (1991). *Sep. Sci. Technol.*, 28 (6): 1361–1378.
13. Ray, M.S. (1992) Distillation (1980–1990): A bibliography. *Sep. Sci. Technol.*, 27 (1): 105–128.