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## Equilibrium-Staged Separations: A Bibliography Update (1999)

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## BIBLIOGRAPHY

# Equilibrium-Staged Separations: A Bibliography Update (1999)

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## ABSTRACT

This article continues a series of annual bibliographic updates of the published literature (since 1980) on distillation and other equilibrium-staged separation processes (1–8). This paper provides a useful and quick reference source to the 1999 journal literature (from the 50 most important chemical engineering journals) for researchers in this area. The following topics are included:

- Distillation theory and design methods
- Distillation control and applications
- Column design data
- Absorption reactions, absorber design, and cooling towers
- Liquid–liquid extraction
- Supercritical extraction

A complete bibliographic listing of the chemical engineering journal literature from 1959 to 1999 (with subsequent 6-month updates) is available on a CD-ROM database (9) and full details can be obtained from the author.

## Distillation Theory and Design Methods

- Baur, R., Higler, A. P., and Taylor, R., “Comparison of equilibrium stage and nonequilibrium stage models for reactive distillation,” *Chem. Eng. J.*, 76(1), 33–48 (1999).
- Baur, R., Taylor, R., and Krishna, R., “Influence of mass transfer in distillation of mixtures with a distillation boundary,” *Chem. Eng. Res. Des.*, 77(6), 561–565 (1999).
- Bildea, C. S., and Dimian, A. C., “Singularity theory approach to ideal binary distillation,” *AIChE J.*, 45(12), 2662–2666 (1999).
- Espinosa, J., Aguirre, P., and Frey, T., “Analysis of finishing reactive distillation columns,” *Ind. Eng. Chem. Res.*, 38(1), 187–196 (1999).

- Ho, C. D., Yeh, H. M., and Sheu, W. S., "The influence of recycle on double-pass heat and mass transfer through a parallel-plate device," *Int. J. Heat Mass Transfer*, 42(9), 1707–1722 (1999).
- Kim, J. K., and Ju, D. P., "Shortcut procedure for multicomponent batch distillation with distillate receiver," *Ind. Eng. Chem. Res.*, 38(3), 1024–1031, 1176 (1999).
- Kreul, L. U., Gorak, A., and Barton, P. I., "Dynamic rate-based model for multicomponent batch distillation," *AIChE J.*, 45(9), 1953–1962 (1999).
- Rusche, F. A., "Gilliland plot revisited," *Hydrocarbon Process.*, 78(2), 79–80 (1999).
- Sorensen, E., "A cyclic operating policy for batch distillation: Theory and practice," *Comput. Chem. Eng.*, 23(4), 533–542 (1999).
- Vogelpohl, A., "On the relation between ideal and real systems in ternary distillation," *Chem. Eng. Res. Des.*, 77(6), 487–492 (1999).
- von Watzdorf, R., Bausa, J., and Marquardt, W., "Shortcut methods for nonideal multicomponent distillation: Complex columns," *AIChE J.*, 45(8), 1615–1628 (1999).
- Yang, N. S., Xu, Z. P., and Chuang, K. T., "Determine the number of theoretical plates with commercial simulators," *Hydrocarbon Process.*, 78(8), 109–116 (1999).
- Yu, K. T., Yuan, X. G., and You, X. Y., "Computational fluid-dynamics and experimental verification of two-phase two-dimensional flow on a sieve column tray," *Chem. Eng. Res. Des.*, 77(6), 554–560 (1999).
- Zuiderweg, F. J., "Distillation composition profiles: What do they tell us?" *Chem. Eng. Res. Des.*, 77(6), 475–481 (1999).

## Distillation Control and Applications

- Agrawal, R., "More operable fully thermally coupled distillation column configurations for multicomponent distillation," *Chem. Eng. Res. Des.*, 77(6), 543–553 (1999).
- Agrawal, R., and Fidkowski, Z. T., "New thermally coupled schemes for ternary distillation," *AIChE J.*, 45(3), 485–496 (1999).
- Agrawal, R., and Fidkowski, Z. T., "Thermodynamically efficient systems for ternary distillation," *Ind. Eng. Chem. Res.*, 38(5), 2065–2074 (1999).
- Allgor, R. J., Evans, L. B., and Barton, P. I., "Screening models for batch process development: Design targets for reaction/distillation networks," *Chem. Eng. Sci.*, 54(19), 4145–4164 (1999).
- Arce, A., Rodil, E., and Soto, A., "Extractive distillation of 2-methoxy-2-methylpropane plus ethanol using 1-butanol as entrainer: Equilibria and simulation," *Can. J. Chem. Eng.*, 77(6), 1135–1140 (1999).
- Bagajewicz, M. J., "Energy savings horizons for the retrofit of chemical processes: Application to crude fractionation units," *Comput. Chem. Eng.*, 23(1), 1–10 (1999).
- Bandyopadhyay, S., Malik, R. K., and Shenoy, U. V., "Invariant rectifying-stripping curves for targeting minimum energy and feed location in distillation," *Comput. Chem. Eng.*, 23(8), 1109–1124 (1999).
- Baudot, A., and Marin, M., "Improved recovery of an ester flavor compound by pervaporation coupled with a flash condensation," *Ind. Eng. Chem. Res.*, 38(11), 4458–4469 (1999).
- Bezzo, F., Bertucco, A., and Forlin, A., "Steady-state analysis of an industrial reactive distillation column," *Sep. Purif. Technol.*, 16(3), 251–260 (1999).
- Bildea, C. S., and Dimian, A. C., "Interaction between design and control of a heat-integrated distillation system with prefractionator," *Chem. Eng. Res. Des.*, 77(7), 597–608 (1999).
- Billingham, J. F., and Lockett, M. J., "Development of a new generation of structured packings for distillation," *Chem. Eng. Res. Des.*, 77(7), 583–587 (1999).
- Blankenship, K. D., Shah, V. M., and Tsouris, C., "Distillation under electric fields," *Sep. Sci. Technol.*, 34(6), 1393–1410 (1999).

- Bonny, L., "Multicomponent batch distillations: Study of operating parameters," *Ind. Eng. Chem. Res.*, 38(12), 4759–4768 (1999).
- Brooks, R. W., van Walsem, F. D., and Drury, J., "Choosing cutpoints to optimize product yields," *Hydrocarbon Process.*, 78(11), 53–60 (1999).
- Brownlie, R., "Short path distillation," *Process Eng. (London)*, 80(5), 31 (1999).
- Caballero, J. A., and Grossmann, I. E., "Aggregated models for integrated distillation systems," *Ind. Eng. Chem. Res.*, 38(6), 2330–2344 (1999).
- Cheong, W., and Barton, P. I., "Azeotropic distillation in a middle vessel batch column: Model formulation and linear separation boundaries," *Ind. Eng. Chem. Res.*, 38(4), 1504–1530 (1999).
- Cheong, W., and Barton, P. I., "Azeotropic distillation in a middle vessel batch column: Non-linear separation boundaries," *Ind. Eng. Chem. Res.*, 38(4), 1531–1548 (1999).
- Cheong, W., and Barton, P. I., "Azeotropic distillation in a middle vessel batch column: Model validation," *Ind. Eng. Chem. Res.*, 38(4), 1549–1564 (1999).
- Chien, I. L., Wang, C. J., and Wong, D. S. H., "Dynamics and control of a heterogeneous azeotropic distillation column: Conventional control approach," *Ind. Eng. Chem. Res.*, 38(2), 468–478 (1999).
- Chung, T. W., Lai, C. H., and Wu, H., "Analysis of mass transfer performance in an air stripping tower," *Sep. Sci. Technol.*, 34(14), 2837–2852 (1999).
- Darton, R. C., and Sun, K. H., "The effect of surfactant on foam and froth properties," *Chem. Eng. Res. Des.*, 77(6), 535–542 (1999).
- Di, W., Zhicai, Y., and Ronglan, Z., "Evolution of pinch-point zones in multicomponent distillation columns: Stripping section," *Ind. Eng. Chem. Res.*, 38(5), 2151–2155 (1999).
- Dunnebie, G., and Pantelides, C. C., "Optimal design of thermally coupled distillation columns," *Ind. Eng. Chem. Res.*, 38(1), 162–176 (1999).
- Ellenberger, J., and Krishna, R., "Counter-current operation of structured catalytically packed distillation columns: Pressure drop, holdup and mixing," *Chem. Eng. Sci.*, 54(10), 1339–1345 (1999).
- Espinosa, J., and Salomone, E., "Minimum reflux for batch distillations of ideal and nonideal mixtures at constant reflux," *Ind. Eng. Chem. Res.*, 38(7), 2732–2746 (1999).
- Fikar, M., Latifi, M. A., and Creff, Y., "Optimal changeover profiles for an industrial depropanizer," *Chem. Eng. Sci.*, 54(13), 2715–2720 (1999).
- Frey, T., and Stichlmair, J., "Reactive azeotropes in kinetically controlled reactive distillation," *Chem. Eng. Res. Des.*, 77(7), 613–618 (1999).
- Furlonge, H. I., Pantelides, C. C., and Sorensen, E., "Optimal operation of multivessel batch distillation columns," *AIChE J.*, 45(4), 781–801 (1999).
- Giessler, S., Danilov, R. Y., and Pisarenko, R. Y., "Feasible separation modes for various reactive distillation systems," *Ind. Eng. Chem. Res.*, 38(10), 4060–4067 (1999).
- Guttinger, T. E., and Morari, M., "Predicting multiple steady states in equilibrium reactive distillation: Analysis of nonhybrid systems," *Ind. Eng. Chem. Res.*, 38(4), 1633–1648 (1999).
- Guttinger, T. E., and Morari, M., "Predicting multiple steady states in equilibrium reactive distillation: Analysis of hybrid systems," *Ind. Eng. Chem. Res.*, 38(4), 1649–1665 (1999).
- Han, M., and Park, S., "Startup of distillation columns using profile position control based on a nonlinear wave model," *Ind. Eng. Chem. Res.*, 38(4), 1565–1574 (1999).
- Hanika, J., Kolena, J., and Smejkal, Q., "Butylacetate via reactive distillation: Modelling and experiment," *Chem. Eng. Sci.*, 54(21), 5205–5210 (1999).
- Hanson, D. W., Lieberman, N. P., and Lieberman, E. T., "De-entrainment and washing of flash-zone vapors in heavy oil fractionators," *Hydrocarbon Process.*, 78(7), 55–60 (1999).
- Hapoglu, H., Karacan, S., and Cabbar, Y., "Application of multivariable generalized predictive control to a packed distillation column," *Chem. Eng. Commun.*, 174, 61–84 (1999).

- Hasebe, S., Noda, M., and Hashimoto, I., "Optimal operation policy for total reflux and multi-effect batch distillation systems," *Comput. Chem. Eng.*, 23(4), 523–532 (1999).
- Hernandez, S., and Jimenez, A., "Controllability analysis of thermally coupled distillation systems," *Ind. Eng. Chem. Res.*, 38(10), 3957–3963 (1999).
- Hewitt, G., Quarini, J., and Morrell, M., "More efficient distillation," *Chem. Eng. (Rugby, Engl.)*, 21 October, 16–18 (1999).
- Higler, A. P., Taylor, R., and Krishna, R., "Nonequilibrium modelling of reactive distillation: Multiple steady states in MTBE synthesis," *Chem. Eng. Sci.*, 54(10), 1389–1395 (1999).
- Higler, A. P., Taylor, R., and Krishna, R., "The influence of mass transfer and mixing on the performance of a tray column for reactive distillation," *Chem. Eng. Sci.*, 54(13), 2873–2882 (1999).
- Ismail, S. R., Pistikopoulos, E. N., and Papalexandri, K. P., "Modular representation synthesis framework for homogeneous azeotropic separation," *AIChE J.*, 45(8), 1701–1720 (1999).
- Jones, W. E., Vais, A. M., and Wilson, J. A., "Getting the maximum benefit from a side-reboiler," *Chem. Eng. Commun.*, 171, 195–209 (1999).
- Kenig, E. Y., Jakobsson, K., and Banik, P., "An integrated tool for synthesis and design of reactive distillation," *Chem. Eng. Sci.*, 54(10), 1347–1352 (1999).
- Kreul, L. U., Gorak, A., and Barton, P. I., "Modeling of homogeneous reactive separation processes in packed columns," *Chem. Eng. Sci.*, 54(1), 19–34 (1999).
- Kumar, A., and Daoutidis, P., "Modeling, analysis and control of ethylene glycol reactive distillation column," *AIChE J.*, 45(1), 51–68 (1999).
- Kumpabooth, K., Scamehorn, J. F., and Osuwan, S., "Surfactant recovery from water using foam fractionation: Effect of temperature and added salt," *Sep. Sci. Technol.*, 34(2), 157–172 (1999).
- Lee, J. H., and Dudukovic, M. P., "A comparison of the equilibrium and nonequilibrium models for a multicomponent reactive distillation column," *Comput. Chem. Eng.*, 23(1), 159–172 (1999).
- Lee, M., Dorn, C., Meski, G. A., and Morari, M., "Limit cycles in homogeneous azeotropic distillation," *Ind. Eng. Chem. Res.*, 38(5), 2021–2027 (1999).
- Li, Y., Chen, H., and Liu, J., "Composition profile of an azeotropic continuous distillation with feed composition on a ridge or in a valley," *Ind. Eng. Chem. Res.*, 38(6), 2482–2484 (1999).
- Mahajani, S. M., "Design of reactive distillation columns for multicomponent kinetically controlled reactive systems," *Chem. Eng. Sci.*, 54(10), 1425–1430 (1999).
- Mahajani, S. M., "Kinetic azeotropy and design of reactive distillation columns," *Ind. Eng. Chem. Res.*, 38(1), 177–186 (1999).
- Milani, S. M., "Optimization of solvent feed rate for maximum recovery of high purity top product in batch extractive distillation," *Chem. Eng. Res. Des.*, 77(5), 469–470 (1999).
- Mohl, K. D., Kienle, A., and Gilles, E. D., "Steady-state multiplicities in reactive distillation columns for the production of fuel ethers MTBE and TAME: Theoretical analysis and experimental verification," *Chem. Eng. Sci.*, 54(8), 1029–1043 (1999).
- Monroy-Loperena, R., and Alvarez-Ramirez, J., "On the steady-state multiplicities for an ethylene glycol reactive distillation column," *Ind. Eng. Chem. Res.*, 38(2), 451–455 (1999).
- Moritz, P., and Hasse, H., "Fluid dynamics in reactive distillation packing Katapak-S," *Chem. Eng. Sci.*, 54(10), 1367–1374 (1999).
- Mujtaba, I. M., "Optimization of batch extractive distillation processes for separating close boiling and azeotropic mixtures," *Chem. Eng. Res. Des.*, 77(7), 588–596 (1999).
- Nye, J. O., Herzog, K., and Cheaney, S., "Use a side reboiler to increase tower capacity," *Hydrocarbon Process.*, 78(9), 51–56 (1999).
- Parkinson, G., "The divide in distillation," *Chem. Eng. (N.Y.)*, April, 32–35 (1999).
- Pasad, G. V., and Venkatarathnam, G., "A method for avoiding trivial roots in isothermal flash calculations using cubic equations of state," *Ind. Eng. Chem. Res.*, 38(9), 3530–3534 (1999).

- Schenk, M., Gani, R., and Bogle, D., "A hybrid modelling approach for separation systems involving distillation," *Chem. Eng. Res. Des.*, 77(6), 519–534 (1999).
- Serafimov, L. A., Pisarenko, Y. A., and Kulov, N. N., "Coupling chemical reaction with distillation: Thermodynamic analysis and practical applications," *Chem. Eng. Sci.*, 54(10), 1383–1388 (1999).
- Sharma, R., Jindal, A., and Mandawala, D., "Design/retrofit targets of pump-around refluxes for better energy integration of a crude distillation column," *Ind. Eng. Chem. Res.*, 38(6), 2411–2417 (1999).
- Sneesby, M. G., Tade, M. O., and Smith T. N., "Reaction hysteresis: A new cause of output multiplicity in reactive distillation," *Dev. Chem. Eng. Mineral Process.*, 7(1), 41–56 (1999).
- Subawalla, H., and Fair, J. R., "Design guidelines for solid catalyzed reactive distillation systems," *Ind. Eng. Chem. Res.*, 38(10), 3696–3709 (1999).
- Sundmacher, K., Uhde, G., and Hoffmann, U., "Multiple reactions in catalytic distillation processes for the production of the fuel oxygenates MTBE and TAME: Analysis by rigorous model and experimental validation," *Chem. Eng. Sci.*, 54(13), 2839–2848 (1999).
- Ting, J., Helfferich, F. G., and Hwang, Y. L., "Experimental study of wave propagation dynamics of multicomponent distillation columns," *Ind. Eng. Chem. Res.*, 38(10), 3588–3605 (1999).
- Turner, J., Asquith, R. J., and Atkinson, R., "Stop foaming on hydrotreater 'hot' separator," *Hydrocarbon Process.*, 78(6), 119–124 (1999).
- Venimadhavan, G., Malone, M. F., and Doherty, M. F., "Bifurcation study of kinetic effects in reactive distillation," *AIChE J.*, 45(3), 546–556 (1999).
- Venimadhavan, G., Malone, M. F., and Doherty, M. F., "A novel distillate policy for batch reactive distillation with application to the production of butyl acetate," *Ind. Eng. Chem. Res.*, 38(3), 714–722 (1999).
- Wajge, R. M., and Reklaitis, G. V., "RBD OPT: A general-purpose object-oriented module for distributed campaign optimization of reactive batch distillation," *Chem. Eng. J.*, 75(1), 57–68 (1999).
- Wang, K., Qian, Y., Yuan, Y., and Yao, P., "Synthesis and optimization of heat integrated distillation systems using an improved genetic algorithm," *Comput. Chem. Eng.*, 23(1), 125–136 (1999).
- Wasylikiewicz, S. K., Kobylka, L. C., and Satyro, M. A., "Designing azeotropic distillation columns," *Chem. Eng. (N.Y.)*, August, 80–85 (1999).
- Xu, X., Zhao, Z., and Tian, S. J., "Study on catalytic distillation processes: Axial dispersion of liquid in catalyst bed of catalytic distillation column," *Chem. Eng. Res. Des.*, 77(1), 16–20 (1999).
- Xu, Z., and Dudukovic, M. P., "Modeling and simulation of semi-batch photo-reactive distillation," *Chem. Eng. Sci.*, 54(10), 1397–1403 (1999).
- Xu, Z., Afacan, A., and Chuang, K. T., "Removal of acetic acid from water by catalytic distillation: Experimental studies," *Can. J. Chem. Eng.*, 77(4), 676–681 (1999).
- Xu, Z., Afacan, A., and Chuang, K. T., "Removal of acetic acid from water by catalytic distillation: Modeling and simulation studies," *Can. J. Chem. Eng.*, 77(4), 682–687 (1999).
- Young, H. K., "Optimal design and operation of a multi-product batch distillation column using dynamic model," *Chem. Eng. Process.*, 38(1), 61–72 (1999).

### Column Design Data

- Avraam, D. G., and Payatakes, A. C., "Flow mechanisms, relative permeabilities, and coupling effects in steady-state two-phase flow through porous media: The case of strong wettability," *Ind. Eng. Chem. Res.*, 38(3), 778–786 (1999).

- Billet, R., and Schultes, M., "Prediction of mass transfer columns with dumped and arranged packings: Updated summary of the calculation method of Billet and Schultes," *Chem. Eng. Res. Des.*, 77(6), 498–504 (1999).
- Blet, V., Berne, P. H., and Chaussy, C., "Characterization of a packed column using radioactive tracers," *Chem. Eng. Sci.*, 54(1), 91–101 (1999).
- Chen, D., Fei, W., Pratt, H. R. C., and Stevens, G. W., "Comparison of hydrodynamic and mass transfer performance of SMR, raschig ring, and pulsed perforated plate column," *Solvent Extr. Ion Exch.*, 17(6), 1523–1542 (1999).
- Chen, F., Zhou, R., and Duan, Z., "A novel cross-flow cascade packed column design and simulation," *Ind. Eng. Chem. Res.*, 38(8), 2973–2978 (1999).
- Chen, J., Liu, Y., and Tan, T., "Projection velocities of droplets in the spray regime of sieve tray operation," *Ind. Eng. Chem. Res.*, 38(6), 2505–2509 (1999).
- Cheng, G. J., Yu, A. B., and Zulli, P., "Evaluation of effective thermal conductivity from the structure of a packed bed," *Chem. Eng. Sci.*, 54(19), 4199–4210 (1999).
- Edwards, D. P., Krishnamurthy, K. R., and Potthoff, R. W., "Development of an improved method to quantify maldistribution and its effect on structured packing column performance," *Chem. Eng. Res. Des.*, 77(7), 656–662 (1999).
- Fair, J. R., Trutna, W. R., and Seibert, A. F., "A new, ultracapacity tray for distillation columns," *Chem. Eng. Res. Des.*, 77(7), 619–626 (1999).
- Feng, D., and Aldrich, C., "Effect of fluid properties on two-phase froth characteristics," *Ind. Eng. Chem. Res.*, 38(10), 4110–4112 (1999).
- Fitz, C. W., King, D. W., and Kunes, J. G., "Controlled liquid maldistribution studies on structured packing," *Chem. Eng. Res. Des.*, 77(6), 482–486 (1999).
- Fitz, C. W., Kunes, J. G., and Shariat, A., "Performance of structured packing in a commercial-scale column at pressures of 0.02–27.6 bar," *Ind. Eng. Chem. Res.*, 38(2), 512–518 (1999).
- Hamidi, A., van Berlo, M., and Luyben, K. C. A. M., "Flooding characteristics of aqueous two-phase systems in a countercurrent sieve-plate column," *J. Chem. Technol. Biotechnol.*, 74(3), 244–249 (1999).
- Hanley, B., "The influence of flow maldistribution on the performance of columns containing random packings: A model study for constant relative volatility and total reflux," *Sep. Purif. Technol.*, 16(1), 7–24 (1999).
- Higler, A., Krishna, R., and Taylor, R., "Nonequilibrium cell model for packed distillation columns: The influence of maldistribution," *Ind. Eng. Chem. Res.*, 38(10), 3988–3999 (1999).
- Hodgson, I., and Oloman, C., "Pressure gradient, liquid hold-up and mass transfer in a graphite fibre bed with cocurrent upward gas-liquid flow," *Chem. Eng. Sci.*, 54(23), 5777–5786 (1999).
- Holt, A. J., Azzopardi, B. J., and Biddulph, M. W., "Calculation of two-phase pressure drop for vertical upflow in narrow passages by means of a flow pattern specific model," *Chem. Eng. Res. Des.*, 77(1), 7–15 (1999).
- Hood, A. R., Stander, A., and Lilburne, G., "Vacuum column revamp: A fast-track turnkey project," *Hydrocarbon Process.*, 78(11), 63–70 (1999).
- Kolev, N., "Pressure drop of arranged packings with vertical walls," *Chem. Eng. Process.*, 38(3), 219–224 (1999).
- Krishna, R., van Batan, J. M., and Ellenberger, J., "CFD simulations of sieve tray hydrodynamics," *Chem. Eng. Res. Des.*, 77(7), 639–646 (1999).
- Kronberg, A. E., and Westerterp, K. R., "Nonequilibrium effects in fixed-bed interstitial fluid dispersion," *Chem. Eng. Sci.*, 54(18), 3977–3994 (1999).
- Lopez, F., and Castells, F., "Influence of tray geometry on scaling up distillation efficiency from laboratory data," *Ind. Eng. Chem. Res.*, 38(7), 2747–2753 (1999).

- Lund, K. O., Nguyen, H., and Lord, S. M., "Numerical correlation for thermal conduction in packed beds," *Can. J. Chem. Eng.*, 77(4), 769–774 (1999).
- Macias-Salinas, R., and Fair, J. R., "Axial mixing in modern packings, gas and liquid phases: Single-phase flow," *AIChE J.*, 45(2), 222–239 (1999).
- Marchot, P., Toye, D., and Crine, M., "Investigation of liquid maldistribution in packed columns by X-ray tomography," *Chem. Eng. Res. Des.*, 77(6), 511–518 (1999).
- Mewes, D., Loser, T., and Millies, M., "Modelling of two-phase flow in packings and monoliths," *Chem. Eng. Sci.*, 54(21), 4729–4748 (1999).
- Mota, M., Teixeira, J. A., and Yelshin, A., "Image analysis of packed beds of spherical particles of different sizes," *Sep. Purif. Technol.*, 15(1), 59–68 (1999).
- Mueller, G. E., "Radial void fraction correlation for annular packed beds," *AIChE J.*, 45(11), 2458–2460 (1999).
- Mustafa, H., Bekassy-Molnar, E., and Elhamouz, A., "Hydrodynamics and mass transfer of textile vibrating-valve trays," *Chem. Eng. Res. Des.*, 77(7), 627–632 (1999).
- Nandakumar, K., Shu, Y., and Chuang, K. T., "Predicting geometrical properties of random packed beds from computer simulation," *AIChE J.*, 45(11), 2286–2297 (1999).
- Nicolaiewsky, E. M., Tavares, F. W., Rajagopal, K., and Fair, J. R., "Liquid film flow and area generation in structured packed columns," *Powder Technol.*, 104(1), 84–94 (1999).
- Nutter, D. E., "The MVG™ tray at FRI," *Chem. Eng. Res. Des.*, 77(6), 493–497 (1999).
- Olsson, F. R., "Detect distributor defects before they cripple columns," *Chem. Eng. Prog.*, 95(10), 57–61 (1999).
- Olujic, Z., "Effect of column diameter on pressure drop of a corrugated sheet structured packing," *Chem. Eng. Res. Des.*, 77(6), 505–510 (1999).
- Olujic, Z., Kamerbeek, A. B., and de Graauw, J., "A corrugation geometry-based model for efficiency of structured distillation packing," *Chem. Eng. Process.*, 38(4), 683–695 (1999).
- Park, J., and Gibbs, S. J., "Mapping flow and dispersion in a packed column by MRI," *AIChE J.*, 45(3), 655–660 (1999).
- Parkinson, G., and Ondrey, G., "Packing towers," *Chem. Eng. (N.Y.)*, 106(13), 39–43 (1999).
- Qiu, J. H., Rocha, J. A., Bravo, J. L., and Fair, J. R., Comments and reply on "Distillation columns containing structured packings: A comprehensive model for their performance: Hydraulic models," *Ind. Eng. Chem. Res.*, 38(8), 3186–3189 (1999).
- Quintard, M., and Whitaker, S., "Dissolution of an immobile phase during flow in porous media," *Ind. Eng. Chem. Res.*, 38(3), 833–844 (1999).
- Sloley, A. W., "Should you switch to high capacity trays?" *Chem. Eng. Prog.*, 95(1), 23–35 (1999).
- Spiegel, L., and Knoche, M., "Influence of hydraulic conditions on separation efficiency of optiflow," *Chem. Eng. Res. Des.*, 77(7), 609–612 (1999).
- Toye, D., Marchot, P., and L'homme, G., "Modelling of the liquid distribution in a trickle flow packed column based upon X-ray tomography images," *Chem. Eng. Commun.*, 175, 131–155 (1999).
- Verschoof, H. J., Olujic, Z., and Fair, J. R., "A general correlation for predicting the loading point of corrugated sheet structured packings," *Ind. Eng. Chem. Res.*, 38(10), 3663–3669 (1999).
- Wang, S., Chung, K. H., and Masliyah, J. H., "Deposition of fine particles in packed beds at hydrotreating conditions: Role of surface chemistry," *Ind. Eng. Chem. Res.*, 38(12), 4878–4888 (1999).
- Wang, Y., and James, P. W., "Assessment of an eddy-interaction model and its refinements using predictions of droplet deposition in a wave-plate demister," *Chem. Eng. Res. Des.*, 77(8), 692–698 (1999).

- Whaley, A. K., Bode, C. A., and Ghosh, J., "HETP and pressure drop prediction for structured packing distillation columns using a neural network model," *Ind. Eng. Chem. Res.*, 38(4), 1736–1739 (1999).
- Wijn, E. F., "Weir flow and liquid height on sieve and valve trays," *Chem. Eng. J.*, 73(3), 191–204 (1999).

### Absorption Reactions, Absorber Design, and Cooling Towers

- Abdi, M. A., and Meisen, A., "A novel process for diethanolamine recovery from partially degraded solutions: Process description and phase equilibria of the DEA-BHEP-THEED-hexadecane system," *Ind. Eng. Chem. Res.*, 38(8), 3096–3104 (1999).
- Abdi, M. A., and Meisen, A., "A novel process for diethanolamine recovery from partially degraded solutions: Process analysis," *Ind. Eng. Chem. Res.*, 38(8), 3105–3114 (1999).
- Adewuyi, Y. G., He, X. D., and Shaw, H., "Simultaneous absorption and oxidation of NO and sulphur dioxide by aqueous solutions of sodium chlorite," *Chem. Eng. Commun.*, 174, 21–51 (1999).
- Aroonwilas, A., Veawab, A., and Tontiwachwuthikul, P., "Behavior of the mass-transfer coefficient of structured packings in carbon dioxide absorbers with chemical reactions," *Ind. Eng. Chem. Res.*, 38(5), 2044–2050 (1999).
- Baird, M. H. I., and Nirdosh, I., "Low-cost experiments in mass transfer: Desorption of ammonia from a liquid jet," *Chem. Eng. Educ.*, 33(4), 328–331 (1999).
- Dohnal, V., and Hovorka, S., "Exponential saturator: A novel gas-liquid partitioning technique for measurement of large limiting activity coefficients," *Ind. Eng. Chem. Res.*, 38(5), 2036–2043 (1999).
- DuPart, M. S., Rooney, P. C., and Bacon, T. R., "Comparing laboratory and plant data for MDEA/DEA blends," *Hydrocarbon Process.*, 78(4), 81–86 (1999).
- Ebeling, H. O., Lyddon, L. G., and Covington, K. K., "Reduce emissions from dehydration units," *Hydrocarbon Process.*, 78(4), 107–116 (1999).
- Evren, V., Cagatay, T., and Ozdural, A. R., "Carbon dioxide-air mixtures: Mass transfer in recycling packed-bed absorption columns operating under high liquid flow rates," *Sep. Purif. Technol.*, 17(2), 89–96 (1999).
- Gaddis, E. S., "Mass transfer in gas-liquid contactors," *Chem. Eng. Process.*, 38(4), 503–510 (1999).
- Gretschner, H., and Schaber, K., "Aerosol formation by heterogeneous nucleation in wet scrubbing processes," *Chem. Eng. Process.*, 38(4), 541–548 (1999).
- Hua, L. Q., Shuo, Y., and Lin, T. J., "A new complex absorbent used for improving propylene carbonate absorbent for carbon dioxide removal," *Sep. Purif. Technol.*, 16(2), 133–138 (1999).
- Ji, X., Kritiphat, W., and Aboudheir, A., "Mass transfer parameter estimation using optimization technique: Case study in carbon dioxide absorption with chemical reaction," *Can. J. Chem. Eng.*, 77(1), 69–73 (1999).
- Karcz, J., "Studies of local heat transfer in a gas-liquid system agitated by double disc turbines in a slender vessel," *Chem. Eng. J.*, 72(3), 217–227 (1999).
- Kenig, E. Y., Schneider, R., and Gorak, A., "Rigorous dynamic modelling of complex reactive absorption processes," *Chem. Eng. Sci.*, 54(21), 5195–5204 (1999).
- Kueniewska-Lach, I., "Estimation of phase velocities at flooding point in packed columns for any gas/liquid system," *Can. J. Chem. Eng.*, 77(3), 433–446 (1999).
- Launaro, P. M., and Paglianti, A., "Performance of absorption columns equipped with low pressure drops structured packings," *Ind. Eng. Chem. Res.*, 38(9), 3481–3488 (1999).

- Lee, S. Y., and Tsui, Y. P., "Succeed at gas/liquid contacting," *Chem. Eng. Prog.*, 95(7), 23–49 (1999).
- Lin, C., Zhou, M., and Xu, C. J., "Axisymmetrical two-dimensional heterogeneous mass transfer model for the absorption of gas into liquid-liquid dispersions," *Chem. Eng. Sci.*, 54(3), 389–399 (1999).
- Mehra, A., "Heterogeneous modeling of gas absorption in emulsions," *Ind. Eng. Chem. Res.*, 38(6), 2460–2468 (1999).
- Meldon, J., "Simplify calculations for absorption with chemical reactions," *Chem. Eng. (N. Y.)*, November, 86–91 (1999).
- Min, J. K., and Choi, D. H., "Analysis of the absorption process on a horizontal tube using Navier-Stokes equations with surface-tension effects," *Int. J. Heat Mass Transfer*, 42(24), 4567–4578 (1999).
- Ondrey, G., "Codes of Practice for cooling towers," *Chem. Eng. (N. Y.)*, August, 29–33 (1999).
- Parkinson, G., and Ondrey, G., "Packing towers," *Chem. Eng. (N.Y.)*, 106(13), 39–43 (1999).
- Pawelczyk, R., "A dynamic method for dispersing gases in liquids," *Chem. Eng. Process.*, 38(2), 95–107 (1999).
- Pradhan, M. P., and Joshi, J. B., "Absorption of NO<sub>x</sub> gases in aqueous NaOH solutions: Selectivity and optimization," *AIChE J.*, 45(1), 38–50 (1999).
- Saha, A. K., Biswas, A. K., and Bandyopadhyay, S. S., "Absorption of carbon dioxide in a sterically hindered amine: Modeling absorption in a mechanically agitated contactor," *Sep. Purif. Technol.*, 15(2), 101–112 (1999).
- Schneider, R., Kenig, E. Y., and Gorak, A., "Dynamic modelling of reactive absorption with the Maxwell-Stefan approach," *Chem. Eng. Res. Des.*, 77(7), 633–638 (1999).
- Shen, J. F., Yang, Y. M., and Maa, J. R., "Surfactant effects on gas absorption in a coke-oven gas treatment process," *Can. J. Chem. Eng.*, 77(5), 1013–1020 (1999).
- Stockfleth, R., and Brunner, G., "Hydrodynamics of a packed countercurrent column for the gas extraction," *Ind. Eng. Chem. Res.*, 38(10), 4000–4006 (1999).
- Taghizadeh, M., Jallut, C., and Tayakout-Fayolle, M., "Numerical simulation of non-isothermal gas-liquid absorption with chemical reaction on a spherical laminar film: Application to phosgene absorption into aqueous sodium hydroxide solutions," *Chem. Eng. Sci.*, 54(6), 807–818 (1999).
- Vallee, G., Mougin, P., and Jullian, S., "Representation of carbon dioxide and hydrogen sulfide absorption by aqueous solutions of diethanolamine using an electrolyte equation of state," *Ind. Eng. Chem. Res.*, 38(9), 3473–3480 (1999).
- Van Dam, M. H. H., Corriou, J. P., and Midoux, N., "Modelling and measurement of sulfur dioxide absorption rate in a laminar falling film reactor," *Chem. Eng. Sci.*, 54(21), 5311–5318 (1999).
- Vazquez, G., Chenlo, F., and Pereira, G., "Enhancement of the absorption of carbon dioxide in alkaline buffer solutions: Joint action of two enhancers," *Ind. Eng. Chem. Res.*, 38(5), 2160–2162 (1999).
- Veawab, A., Tontiwachwuthikul, P., and Chakma, A., "Influence of process parameters on corrosion behavior in a sterically hindered amine-carbon dioxide system," *Ind. Eng. Chem. Res.*, 38(1), 310–315 (1999).
- Waldie, B., Johnston, T., and Harris, W. K., "Bubble characteristics in a high intensity gas/liquid contactor," *Chem. Eng. Sci.*, 54(21), 5319–5328 (1999).
- Warnecke, H. J., Schafer, M., and Pruss, J., "A concept of simulating an industrial-size tube reactor with fast complex kinetics and absorption of two gases on the basis of CFD modeling," *Chem. Eng. Sci.*, 54(13), 2513–2520 (1999).
- Zapfel, W., Marr, R., and Siebenhofer, M., "Absorptive separation of NO from dilute off-gas," *Sep. Sci. Technol.*, (6), 1429–1446 (1999).

- Zhao, L. L., and Rochelle, G. T., "Mercury absorption in aqueous hypochlorite," *Chem. Eng. Sci.*, 54(5), 655–662 (1999).

### Liquid–Liquid Extraction

- Adams, M. D., "Extraction of M AuCN<sub>2</sub> ion pairs into organic solvents from aqueous solution," *Sep. Sci. Technol.*, 34(10), 2039–2060 (1999).
- Ahmad, B. S., and Barton, P. I., "Solvent recovery targeting," *AIChE J.*, 45(2), 335–349 (1999).
- Alguacil, F. J., "Modeling AuCN<sup>2-</sup> extraction by mixtures of Primene-JMT and Cyanex-925 reagents," *AIChE J.*, 45(10), 2136–2141 (1999).
- Alguacil, F. J., and Alonso, M., "Recovery of copper from ammoniacal/ammonium sulphate medium by LIX-54," *J. Chem. Technol. Biotechnol.*, 74(12), 1171–1175 (1999).
- Alguacil, F. J., and Cobo, A., "Solvent extraction with LIX-973N for the selective separation of copper and nickel," *J. Chem. Technol. Biotechnol.*, 74(5), 467–471 (1999).
- Alonso, A. I., Galan, B., and Gonzalez, M., "Experimental and theoretical analysis of a nondispersive solvent extraction pilot plant for the removal of Cr(VI) from a galvanic process wastewaters," *Ind. Eng. Chem. Res.*, 38(4), 1666–1675 (1999).
- Alopaeus, V., Koskinen, J., and Keskinen, K. I., "Simulation of the population balances for liquid-liquid systems in a nonideal stirred tank: Description and qualitative validation of the model," *Chem. Eng. Sci.*, 54(24), 5887–5900 (1999).
- Aravamudan, K., and Baird, M. H. I., "Effects of mass transfer on the hydrodynamic behavior of a Karr reciprocating plate column," *Ind. Eng. Chem. Res.*, 38(4), 1596–1604 (1999).
- Barrans, R. E., McAlister, D. R., and Herlinger, A. W., "Hydrogen bonding in aggregates of dialkyl-substituted diphosphonic acids and monofunctional analogues," *Solvent Extr. Ion Exch.*, 17(5), 1195–1218 (1999).
- Belova, V. V., Kholkin, A. I., and Jidkova, T. I., "Solvent extraction of palladium from chloride solutions by alkyl-ammonium di(2-ethylhexyl)dithiophosphates," *Solvent Extr. Ion Exch.*, 17(6), 1473–1492 (1999).
- Birdwell, J. F., "Uranium extraction selectivities of dibutyl carbitol and tributyl phosphate in the system [UO<sub>2</sub>(NO<sub>3</sub>)<sub>2</sub>]-nitric acid-water-aluminum nitrate-solvent," *Sep. Sci. Technol.*, 34(6), 987–1006 (1999).
- Bogacki, M. B., "Effect of various phenomena in the organic phase on metal extraction with chelating reagents in countercurrent and crosscurrent extraction systems," *Ind. Eng. Chem. Res.*, 38(4), 1611–1617 (1999).
- Bolton, G. T., Korchinsky, W. J., and Waterfall, R. C., "Imaging immiscible liquid-liquid systems by capacitance tomography," *Chem. Eng. Res. Des.*, 77(8), 699–708 (1999).
- Borowiak-Resterna, A., "Extraction of copper(II) from acid chloride solutions by N-dodecyl- and N,N-dihexyl-pyridinecarboxamides," *Solvent Extr. Ion Exch.*, 17(1), 133–148 (1999).
- Bressler, E., and Braun, S., "Separation mechanisms of citric and itaconic acids by water-immiscible amines," *J. Chem. Technol. Biotechnol.*, 74(9), 891–896 (1999).
- Chambliss, C. K., Martin, C. R., and Strauss, S. H., "Comparison of the lipophilic redoxrecyclable extractant [Fe(n5-C<sub>5</sub>H<sub>3</sub>(s-C<sub>7</sub>H<sub>15</sub>)<sub>2</sub>)<sub>2</sub>][NO<sub>3</sub>] with [N(n-C<sub>7</sub>H<sub>15</sub>)<sub>4</sub>][NO<sub>3</sub>] for liquid-liquid anion-exchange of aqueous 99TcO<sup>4-</sup>," *Solvent Extr. Ion Exch.*, 17(3), 553–584 (1999).
- Chen, L. H., and Lee, Y. L., "The effects of a surfactant on the mass transfer in spray-tower extraction column," *Chem. Eng. J.*, 73(1), 77–81 (1999).
- Chhatre, M. H., and Shinde, V. M., "Analytical separation of scandium(III) from yttrium(III) and lanthanum(III) by tributyl phosphine oxide (TBPO)" *Sep. Purif. Technol.*, 17(2), 117–124 (1999).
- Chiarizia, R., Dietz, M. L., and Horwitz, E. P., "Radium separation through complexation by aqueous crown ethers and ion-exchange or solvent extraction," *Sep. Sci. Technol.*, 34(6), 931–950 (1999).

- Chiarizia, R., Urban, V., and Thiyagarajan, P., "Aggregation of complexes formed in the extraction of selected metal cations by P,P'-di(2-ethylhexyl) methanediphosphonic acid," *Solvent Extr. Ion Exch.*, 17(1), 113–132 (1999).
- Chiarizia, R., Urban, V., and Thiyagarajan, P., "SANS study of aggregation of the complexes formed by selected metal cations and P,P'-di(2-ethylhexyl)ethane- and butane-diphosphonic acids," *Solvent Extr. Ion Exch.*, 17(5), 1171–1194 (1999).
- Comor, J. J., Tolic, A. S., and Kopećni, M. M., "Modelling of the simultaneous extraction of nitric acid and uranyl nitrate with tri-n-butyl phosphate: Application to extraction operation," *Sep. Sci. Technol.*, 34(1), 115–122 (1999).
- Deligoz, H., Pekacar, A. I., and Ozler, M. A., "Solvent extraction of  $\text{Fe}^{3+}$  cation by 25,26,27,28-tetraisonitrosoaceto-calix[4]arene and based ligands," *Sep. Sci. Technol.*, 34(16), 3297–3304 (1999).
- Delmau, L. H., Simon, N., and Schwing-Weill, M. J., "Extraction of trivalent lanthanides and actinides by "CMPO-like" calixarenes," *Sep. Sci. Technol.*, 34(6), 863–876 (1999).
- Dobre, T., Guzun-Stoica, A., and Floarea, O., "Reactive extraction of phenols using sulfuric acid salts of trioctylamine," *Chem. Eng. Sci.*, 54(10), 1559–1563 (1999).
- Dolev, A., Kehat, E., and Lavie, R., "Intensive periodic liquid-liquid extraction in a thin extractant layer," *Ind. Eng. Chem. Res.*, 38(4), 1618–1624 (1999).
- Dreher, T. M., and Demopoulos, G. P., "The conversion of Rh(III) chlorocomplexes to bromocomplexes and their solvent extraction behavior," *Solvent Extr. Ion Exch.*, 17(5), 1231–1254 (1999).
- du Preez, J. G. H., Knoetze, S. E., and Ravindran, S., "Nitrogen reagents in metal ion separation: The separation of palladium from platinum in hydrochloric acid solution by pyrazole derivatives," *Solvent Extr. Ion Exch.*, 17(2), 317–332 (1999).
- Dziwinski, E., and Szymanowski, J., "Composition of Cyanex-925," *Solvent Extr. Ion Exch.*, 17(6), 1515–1522 (1999).
- Eldridge, R. B., and Fair, J. R., "Sieve-tray extractor continuous-phase mixing," *Ind. Eng. Chem. Res.*, 38(1), 218–222 (1999).
- Escudero, I., Cabezas, J. L., and Coca, J., "Liquid-liquid extraction of 2,3-butanediol from dilute aqueous solutions with mixed solvents," *Chem. Eng. Commun.*, 173, 135–146 (1999).
- Fedorov, Y. S., Zilberman, B. Y., and Kulikov, S. M., "Uranium(VI) extraction by TBP in the presence of HDBP," *Solvent Extr. Ion Exch.*, 17(2), 243–258 (1999).
- Flett, D. S., "New reagents or new ways with old reagents for hydrometallurgy" (review paper), *J. Chem. Technol. Biotechnol.*, 74(2), 99–105 (1999).
- Fontas, C., Salvado, V., and Hidalgo, M., "Solvent extraction of Pt(IV) by Aliquat 336 and its application to a solid supported liquid membrane system," *Solvent Extr. Ion Exch.*, 17(1), 149–162 (1999).
- Fu, X., Liu, H., and Chen, H., "Three-phase extraction study of the TOA-alkane/HCl ( $\text{Zn}^{2+}$  or  $\text{Fe}^{3+}$ ) systems," *Solvent Extr. Ion Exch.*, 17(5), 1281–1294 (1999).
- Fujii, T., Yamamoto, T., and Inagawa, J., "Nuclear size and shape effect in chemical isotope effect of gadolinium using dicyclohexano-18-crown-6," *Solvent Extr. Ion Exch.*, 17(5), 1219–1230 (1999).
- Geist, A., Nitsch, W., and Kim, J. I., "On the kinetics of rare earth extraction into D2EHPA," *Chem. Eng. Sci.*, 54(12), 1903–1907 (1999).
- Ghalehchian, J. S., and Slater, M. J., "A possible approach to improving rotating disc contactor design accounting for drop breakage and mass transfer with contamination," *Chem. Eng. J.*, 75(2), 131–144 (1999).
- Goto, M., Matsumoto, S., and Uezu, K., "Development and computational modeling of novel bifunctional organophosphorus extractants for lanthanoid separation," *Sep. Sci. Technol.*, 34(11), 2125–2140 (1999).

- Haeblerl, M., and Blass, E., "Multicomponent effects in liquid-liquid extraction," *Chem. Eng. Res. Des.*, 77(7), 647–655 (1999).
- Hagstrom, I., Spjuth, L., and Enarsson, A., "Synergistic solvent extraction of trivalent americium and europium by 2-bromodecanoic acid and neutral nitrogen-containing reagents," *Solvent Extr. Ion Exch.*, 17(2), 221–242 (1999).
- Henschke, M., and Pfennig, A., "Mass-transfer enhancement in single-drop extraction experiments," *AIChE J.*, 45(10), 2079–2086 (1999).
- Hostrup, M., Harper, P. M., and Gani, R., "Design of environmentally benign processes: Integration of solvent design and separation process synthesis," *Comput. Chem. Eng.*, 23(10), 1395–1414 (1999).
- Hu, X., "Recovery of theophylline effluent with 2-ethylhexanol extraction process," *Sep. Sci. Technol.*, 34(14), 2905–2922 (1999).
- Huddleston, J. G., Ingenito, C. C., and Rogers, R. D., "Partitioning behavior of porphyrin dyes in aqueous biphasic systems," *Sep. Sci. Technol.*, 34(6), 1091–1102 (1999).
- Huddleston, J. G., Willauer, H. D., and Griffin, S. T., "Aqueous polymeric solutions as environmentally benign liquid/liquid extraction media," *Ind. Eng. Chem. Res.*, 38(7), 2523–2539 (1999).
- Iglesias, M., Antico, E., and Salvado, V., "Effect of Y(III) distribution between aqueous nitrate and organic D2EHPA solutions on the Y(III) precipitation stripping using oxalic acid," *Solvent Extr. Ion Exch.*, 17(2), 277–300 (1999).
- Ilias, S., Schimmel, K. A., and Yezek, P. M., "Non-dispersive liquid-liquid extraction of copper and zinc from an aqueous solution by DEHPA and LIX-984 in a hollow fiber membrane module," *Sep. Sci. Technol.*, 34(6), 1007–1020 (1999).
- Imura, H., Kameta, N., and Osada, M., "Enhancement effect of tris(8-quinolinolato)cobalt(III) on the extraction of lanthanide(III) with 2-thenoyltrifluoroacetone," *Solvent Extr. Ion Exch.*, 17(3), 585–596 (1999).
- Jeelani, S. A. K., Panoussopoulos, K., and Hartland, S., "Effect of turbulence on the separation of liquid-liquid dispersions in batch settlers of different geometries," *Ind. Eng. Chem. Res.*, 38(2), 493–501 (1999).
- Juang, R. S., Chen, Y. J., and Huang, I. P., "Amine-based extraction recovery of Cu(II) from aqueous solutions in the presence of EDTA equilibrium studies," *Sep. Sci. Technol.*, 34(15), 3099–3112 (1999).
- Juang, R. S., and Huang, I. P., "Extraction of copper(II)-NTA chelated anions from water with Aliquat 336," *Sep. Sci. Technol.*, 34(12), 2407–2420 (1999).
- Juang, R. S., and Wu, R. T., "Rates of acetate extraction from simulated waste streams in chloromycetin production," *J. Chem. Technol. Biotechnol.*, 74(12), 1165–1170 (1999).
- Juang, R. S., and Wu, R. T., "Extraction of acetate from simulated waste solutions in chloromycetin production," *Sep. Purif. Technol.*, 17(3), 225–234 (1999).
- Katsuta, S., and Yanagihara, H., "Extraction enhancement of titanium(IV) acetylacetonate in the presence of phenols," *Solvent Extr. Ion Exch.*, 17(2), 391–402 (1999).
- Kneissl, F., Geist, A., and Nitsch, W., "Europium extraction into D2EHPA: Kinetics of mass transfer in a stirred cell," *Solvent Extr. Ion Exch.*, 17(3), 475–494 (1999).
- Kocjan, R., and Swieboda, R., "Silica gel treated with a mixture of Aliquat 336 and acid Alizarin violet-N and its application," *Sep. Sci. Technol.*, 34(13), 2571–2582 (1999).
- Kolarik, Z., Mullich, U., and Gassner, F., "Selective extraction of Am(III) over Eu(III) by 2,6-ditriazolyl- and 2,6-ditriazinyl-pyridines," *Solvent Extr. Ion Exch.*, 17(1), 23–32 (1999).
- Kolarik, Z., Mullich, U., and Gassner, F., "Extraction of Am(III) and Eu(III) nitrates by 2,6-di-(5,6-dipropyl-1,2,4-triazin-3-yl)pyridines," *Solvent Extr. Ion Exch.*, 17(5), 1155–1170 (1999).
- Koullas, D. P., Umealu, O. S., and Koukios, E. G., "Solvent selection for the extraction of ethanol from aqueous solutions," *Sep. Sci. Technol.*, 34(11), 2153–2164 (1999).

- Krishna, R., Urseanu, M. I., and Van Baten, J. M., "Rise velocity of a swarm of large gas bubbles in liquids," *Chem. Eng. Sci.*, 54(2), 171–183 (1999).
- Kuipa, P. K., and Hughes, M. A., "Influence of high voltage electric fields applied across a horizontal liquid-liquid interface on the rate of metal extraction using a rotating diffusion cell," *Sep. Sci. Technol.*, 34(13), 2643–2662 (1999).
- Kumar, A., and Hartland, S., "Correlations for prediction of mass transfer coefficients in single drop systems and liquid-liquid extraction columns," *Chem. Eng. Res. Des.*, 77(5), 372–384 (1999).
- Kumar, A., and Hartland, S., "Computational strategies for sizing liquid-liquid extractors," *Ind. Eng. Chem. Res.*, 38(3), 1040–1056 (1999).
- Lamb, J. D., Nazarenko, A. Y., and Hansen, R. J., "Novel solvent system for metal ion separation: Improved solvent extraction of strontium(II) and lead(II) as dicyclohexano-18-crown-6 complexes," *Sep. Sci. Technol.*, 34(13), 2583–2600 (1999).
- Landgren, A., and Liljenzin, J. O., "Extraction behavior of technetium actinides in the Aliquat-336/nitric acid system," *Solvent Extr. Ion Exch.*, 17(6), 1387–1402 (1999).
- Lee, J. C., Jeong, J., and Park, J. T., "Selective and simultaneous extractions of Zn and Cu ions by hollow fiber SLM modules containing HEH(EHP) and LIX-84," *Sep. Sci. Technol.*, 34(8), 1689–1702 (1999).
- Lefrancois, L., Belnet, F., and Tondre, C., "An attempt to theoretically predict third-phase formation in the dimethyldibutyltetradecylmalonamide (DMDBTDMA)/dodecane/water/nitric acid extraction system," *Sep. Sci. Technol.*, 34(5), 755–770 (1999).
- Leonard, R. A., "Design rules for solvent extraction," *Solvent Extr. Ion Exch.*, 17(3), 597–612 (1999).
- Leonard, R. A., Conner, C., and Liberatore, M. W., "Developing and testing an alkaline-side solvent extraction process for technetium separation from tank waste," *Sep. Sci. Technol.*, 34(6), 1043–1068 (1999).
- Liu, S., and Li, D., "Drop coalescence in turbulent dispersions," *Chem. Eng. Sci.*, 54(23), 5667–5676 (1999).
- Liu, Y. S., Dai, Y. Y., and Wang, J. D., "Distribution behavior of L-phenylalanine by extraction with di(2-ethylhexyl) phosphoric acid," *Sep. Sci. Technol.*, 34(11), 2165–2176 (1999).
- Marcilla, A., Gomez, A., and Reyes, J. A., "New method for quaternary systems liquid-liquid extraction tray to tray design," *Ind. Eng. Chem. Res.*, 38(8), 3083–3095 (1999).
- Mathur, A. M., and Scranton, A. B., "Synthesis and ion-binding properties of polymeric pseudocrown ethers: Ion-binding studies," *Sep. Sci. Technol.*, 34(5), 855–870 (1999).
- McNamara, B. K., Lumetta, G. J., and Rapko, B. M., "Extraction of europium(III) ion with tetrahexylmalonamides," *Solvent Extr. Ion Exch.*, 17(6), 1403–1422 (1999).
- Modolo, G., and Odoj, R., "Synergistic selective extraction of actinides(III) over lanthanides from nitric acid using new aromatic diorganyldithiophosphinic acids and neutral organophosphorus compounds," *Solvent Extr. Ion Exch.*, 17(1), 33–54 (1999).
- Molga, E., and Cherbanski, R., "Hybrid first-principle neural-network approach to modelling of the liquid-liquid reacting system," *Chem. Eng. Sci.*, 54(13), 2467–2474 (1999).
- Moris, M. A., Diez, F. V., and Coca, J., "Solvent extraction of molybdenum and tungsten by Alamine 336 and DEHPA in a rotating disc contactor," *Sep. Purif. Technol.*, 17(3), 173–180 (1999).
- Naik, M. T., and Dhadke, P. M., "Liquid-liquid extraction of gallium(III) from acidic nitrate media with bis(2-ethylhexyl) phosphinic acid in toluene," *Solvent Extr. Ion Exch.*, 17(5), 1295–1308 (1999).
- Narbutt, J., "Hydration and solvation of lead(II) acetylacetonate and the coordination number of lead(II)," *Solvent Extr. Ion Exch.*, 17(5), 1271–1280 (1999).
- Nash, K. L., "Aqueous complexes in separations of f-elements: Options and strategies for future development," *Sep. Sci. Technol.*, 34(6), 911–930 (1999).

- Nayak, D., and Lahiri, S., "Separation of the carrier free radioisotopes of lanthanide series elements (review paper)," *Solvent Extr. Ion Exch.*, 17(5), 1133–1154 (1999).
- Nazarenko, A. Y., Baulin, V. E., and Lamb, J. D., "Solvent extraction of metal picrates by phosphoryl-containing podands," *Solvent Extr. Ion Exch.*, 17(3), 495–524 (1999).
- Nekovar, P., and Schrotterova, D., "Extraction of molybdenum(VI) by Primene JMT," *Solvent Extr. Ion Exch.*, 17(1), 163–176 (1999).
- Nishihama, S., Hirai, T., and Komasaawa, I., "Separation and recovery of gallium and indium from simulated zinc refinery residue by liquid-liquid extraction," *Ind. Eng. Chem. Res.*, 38(3), 1032–1039 (1999).
- Nishihama, S., Hirai, T., and Komasaawa, I., "Mechanism of photoreductive stripping of iron(III) in a liquid-liquid extraction system and its application for a hydrometallurgical process," *Ind. Eng. Chem. Res.*, 38(12), 4850–4856 (1999).
- Ohto, K., Tanaka, H., and Ishibashi, H., "Solubility in organic diluents and extraction behavior of calix[4]-arene carboxylates with different alkyl chains," *Solvent Extr. Ion Exch.*, 17(5), 1309–1326 (1999).
- Olukcu, N., Yanik, J., and Saglam, M., "Solvent effect on the extraction of Beypazari oil shale," *Energy Fuels*, 13(4), 895–902 (1999).
- Oshite, S., and Igarashi, S., "Homogeneous liquid-liquid extraction using perfluorooctanesulfonic acid and calcium and its application to the separation and recovery of vitamin B12," *J. Chem. Technol. Biotechnol.*, 74(12), 1183–1187 (1999).
- Ouyang, J. M., "Solvent extraction of palladium(II) with a Schiff base and separation of palladium from Pd(II)-Pt(VI) mixture," *Solvent Extr. Ion Exch.*, 17(5), 1255–1270 (1999).
- Pathak, P. N., Veeraraghavan, R., and Prabhu, D. R., "Separation studies of uranium and thorium using di-2-ethylhexyl isobutyramide (D2HIBA)," *Sep. Sci. Technol.*, 34(13), 2601–2614 (1999).
- Rabbe, C., Sella, C., and Madic, C., "Molecular modeling study of uranyl nitrate extraction with monoamides: Molecular mechanics and lipophilicity calculations, structure-activity relationships," *Solvent Extr. Ion Exch.*, 17(1), 87–112 (1999).
- Rais, J., Selucky, P., and Sistkova, N. V., "Extraction of  $^{137}\text{Cs}$  and  $^{90}\text{Sr}$  from alkaline solutions with high sodium nitrate content with tetrahexyldicarbollide," *Sep. Sci. Technol.*, 34(14), 2865–2886 (1999).
- Rao, D. P., "The futility of raffinate reflux revisited," *Can. J. Chem. Eng.*, 77(1), 74–77 (1999).
- Rickelton, W. A., "The extraction of cadmium from a mixture of phosphoric and hydrochloric acids," *Solvent Extr. Ion Exch.*, 17(6), 1507–1514 (1999).
- Romanovski, V. V., White, D. J., and Xu, J., "Plutonium(IV) and plutonium(VI) extraction by 1-hydroxy-6-N-octylcarboxamide-2(1H)-pyridinone," *Solvent Extr. Ion Exch.*, 17(1), 55–72 (1999).
- Romanovskii, V. V., and Wester D. W., "Effect of aluminum nitrate on extraction of Am, Cm, Eu, and Ce(III) by 18-crown-6 and mixtures of 18-crown-6 and chlorinated cobalt dicarbollide in nitrobenzene," *Sep. Sci. Technol.*, 34(11), 2141–2152 (1999).
- Rovira, M., Cortina, J. L., and Sastre, A. M., "Selective liquid-liquid extraction of palladium(II) from hydrochloric acid media by di-(2-ethylhexyl) thiophosphoric acid (DEHTPA)," *Solvent Extr. Ion Exch.*, 17(2), 333–350 (1999).
- Saboni, A., Gourdon, C., and Chesters, A. K., "The influence of inter-phase mass transfer on the drainage of partially-mobile liquid films between drops undergoing a constant interaction force," *Chem. Eng. Sci.*, 54(4), 461–473 (1999).
- Sachleben, R. A., Bonnesen, P. V., and Descazeaud, T., "Surveying the extraction of cesium nitrate by 1,3-alternate calix[4]-arene crown-6 ethers in 1,2-dichloroethane," *Solvent Extr. Ion Exch.*, 17(6), 1445–1460 (1999).
- Sadaka, M., and Garcia, A., "Extraction of shikimic and quinic acids," *Chem. Eng. Commun.*, 173, 91–102 (1999).

- Sanchez, J. M., Hidalgo, M., and Salvado, V., "Extraction of neodymium(III) at trace level with di(2-ethyl-hexyl)-phosphoric acid in hexane," *Solvent Extr. Ion Exch.*, 17(3), 455–474 (1999).
- Santos, R., Yan, W., and Huang, W., "Extraction behavior and simulation of rare earths in phosphonic acid systems," *Sep. Sci. Technol.*, 34(15), 3077–3098 (1999).
- Sarkar, S. G., and Dhadke, P. M., "Solvent extraction separation of antimony(III) and bismuth(III) with bis(2,4,4-trimethylpentyl) monothiophosphinic acid (Cyanex 302)," *Sep. Purif. Technol.*, 15(2), 131–138 (1999).
- Sastre, A. M., Madi, A., and Cortina, J. L., "Solvent extraction of gold by LIX 79: Experimental equilibrium study," *J. Chem. Technol. Biotechnol.*, 74(4), 310–314 (1999).
- Satake, S., Tsukahara, S., and Suzuki, N., "Synergistic extraction equilibrium of lanthanoids(III) with 2-thenoyltrifluoroacetone and nitrogen-containing bidentate ligands, ethylenediamine derivatives," *Solvent Extr. Ion Exch.*, 17(2), 259–276 (1999).
- Shanley, A., "Solvents: Less is more," *Chem. Eng. (N.Y.)*, 106(13), 57–60 (1999).
- Shiraishi, Y., Hara, H., and Hirai, T., "A deep desulfurization process for light oil by photosensitized oxidation using a triplet photosensitizer and hydrogen peroxide in an oil/water two-phase liquid-liquid extraction system," *Ind. Eng. Chem. Res.*, 38(4), 1589–1595 (1999).
- Singh, R., Khwaja, A. R., and Gupta, B., "Extraction and separation of nickel(II) using bis(2,4,4-trimethylpentyl) dithiophosphonic acid (Cyanex 301) and its recovery from spent catalyst and electroplating bath residue," *Solvent Extr. Ion Exch.*, 17(2), 367–390 (1999).
- Steiner, L., Balmelli, M., and Hartland, S., "Simulation of hydrodynamic performance of stirred extraction column," *AIChE J.*, 45(2), 257–267 (1999).
- Su, Z. G., and Feng, X. L., "Process integration of cell disruption and aqueous two-phase extraction," *J. Chem. Technol. Biotechnol.*, 74(3), 284–288 (1999).
- Suresh, A., Brahmmananda Rao, C. V. S., and Sabharwal, K. N., "Third phase formation in the extraction of Nd(III) by octyl-(phenyl)-N,N-diisobutyl carbamoyl methyl phosphine oxide (O-CMPO)," *Solvent Extr. Ion Exch.*, 17(1), 73–86 (1999).
- Takagi, N., Izumi, Y., and Ema, K., "Radiolytic degradation of a crown ether for extractability of strontium," *Solvent Extr. Ion Exch.*, 17(6), 1461–1472 (1999).
- Takeshita, K., "A mathematical model to predict extraction behavior of metal ions between a polymer gel and an aqueous phase," *Solvent Extr. Ion Exch.*, 17(2), 301–316 (1999).
- Tegrotenhuis, W. E., Cameron, R. J., and Butcher, M. G., "Microchannel devices for efficient contacting of liquids in solvent extraction," *Sep. Sci. Technol.*, 34(6), 951–974 (1999).
- Terasaka, K., Tsuge, H., and Matsue, H., "Bubble formation in cocurrently upward flowing liquid," *Can. J. Chem. Eng.*, 77(3), 458–464 (1999).
- Tobin, T., and Ramkrishna, D., "Modeling the effect of drop charge on coalescence in turbulent liquid-liquid dispersions," *Can. J. Chem. Eng.*, 77(6), 1090–1104 (1999).
- Tripathi, S. C., Sumathi, S., and Ramanujam, A., "Effects of solvent recycling on radiolytic degradation of 30% tributyl phosphate/n-dodecane/nitric acid system," *Sep. Sci. Technol.*, 34(14), 2887–2904 (1999).
- Tritic, T. M., and Comor, J. J., "Extraction of thallium with butyl acetate," *Sep. Sci. Technol.*, 34(5), 771–780 (1999).
- Tulasi, G. L., and Kumar, S., "Amino-acid extraction using D2EHPA: New description of equilibrium behavior," *AIChE J.*, 45(12), 2534–2540 (1999).
- Turanov, A. N., Karandashev, V. K., and Baulin, V. E., "Extraction of metal species from nitric acid solutions by phosphoryl-containing podands," *Solvent Extr. Ion Exch.*, 17(3), 525–552 (1999).
- Turanov, A. N., Karandashev, V. K., and Baulin, V. E., "Extraction of rare-earth elements from nitric solutions by phosphoryl-containing podands," *Solvent Extr. Ion Exch.*, 17(6), 1423–1444 (1999).

- Urtiaga, A. M., Zamacona, S., and Ortiz, M. I., "Analysis of a NDSX process for the selective removal of Cd from phosphoric acid," *Sep. Sci. Technol.*, 34(16), 3279–3296 (1999).
- Vachtova, J., Heyberger, A., and Mrnka, M., "Extraction of sulfuric acid with trialkylamine in a mixed diluent," *Ind. Eng. Chem. Res.*, 38(5), 2028–2035 (1999).
- Varnek, A., and Wipff, G., "Molecular modelling in solvent extraction: Ionophores in pure solutions and at the liquid/liquid interface," *Solvent Extr. Ion Exch.*, 17(6), 1493–1506 (1999).
- Veeraraghavan, R., Mohapatra, P. K., and Manchanda, V. K., "Extraction of americium from nitric acid medium using 3-phenyl-4-benzoyl-5-isoxazolone and tri-n-octylphosphine oxide," *Sep. Sci. Technol.*, 34(1), 123–138 (1999).
- White, K. L., Knutson, B. L., and Kimber, G., "Extraction of coal tar pitch using a mixture of compressed carbon dioxide and toluene," *Ind. Eng. Chem. Res.*, 38(9), 3360–3366 (1999).
- Willauer, H. D., Huddleston, J. G., and Griffin, S. T., "Partitioning of aromatic molecules in aqueous biphasic systems," *Sep. Sci. Technol.*, 34(6), 1069–1090 (1999).
- Wu, Y. T., and Zhu, Z. Q., "Modeling of interfacial tension of aqueous two-phase systems," *Chem. Eng. Sci.*, 54(4), 433–440 (1999).
- Yurdakoc, M., Karakaplan, M., and Hosgoren, H., "Effect of long-chain amines on the extraction of boron from calcium chloride brine with CTMP in petroleum benzene," *Sep. Sci. Technol.*, 34(13), 2615–2626 (1999).
- Zhao, J., Wu, Z., and Chen, J., "Separation of gold from other metals in thiosulfate solutions by solvent extraction," *Sep. Sci. Technol.*, 34(10), 2061–2068 (1999).

## Supercritical Extraction

- Abaroudi, K., Trabelsi, F., and Calloud-Gabriel, B., "Mass transport enhancement in modified supercritical fluid," *Ind. Eng. Chem. Res.*, 38(9), 3505–3518 (1999).
- Al-Jabari, M. E., and Weber, M. E., "Mass transfer model for supercritical fluid extraction tests," *Sep. Sci. Technol.*, 34(14), 2853–2864 (1999).
- Biales, J. M., Wan, Y. D., Kilpatrick, P. K., and Roberts, G. W., "Separation of Fischer-Tropsch wax from catalyst using near-critical fluid extraction: Analysis of process feasibility," *Energy Fuels*, 13(3), 667–677 (1999).
- Brown, J. S., Lesutis, H. P., and Lamb, D. R., "Supercritical fluid separation for selective quaternary ammonium salt promoted esterification of terephthalic acid," *Ind. Eng. Chem. Res.*, 38(10), 3622–3627 (1999).
- Fu, H., and Matthews, M. A., "Separation processes for recovering alloy steels from grinding sludge: Supercritical carbon dioxide extraction and aqueous cleaning," *Sep. Sci. Technol.*, 34(6), 1411–1428 (1999).
- Fullana, M., Trabelsi, F., and Recasens, F., "Use of neural net computing for statistical and kinetic modelling and simulation of supercritical fluid extractors," *Chem. Eng. Sci.*, 54(24), 5845–5862 (1999).
- Gabarra, P., Cogollo, A., and Recasens, F., "Supercritical-fluid process for removal of polychlorodibenzodioxin and dibenzofuran from fly ash," *Environ. Prog.*, 18(1), 40–49 (1999).
- Kim, H. J., Lee, S. B., and Park, K. A., "Characterization of extraction and separation of rice bran oil rich in EFA using SFE process," *Sep. Purif. Technol.*, 15(1), 1–8 (1999).
- Laitinen, A., and Kaunisto, J., "Oldshue-Rushton column in supercritical fluid extraction," *Sep. Sci. Technol.*, 34(9), 1859–1872 (1999).
- Li, L., and Gloyne, E. F., "Separation of ionic species under supercritical water conditions," *Sep. Sci. Technol.*, 34(6), 1463–1478 (1999).
- Lora, M., and Kikic, I., "Polymer processing with supercritical fluids: An overview," *Sep. Purif. Methods*, 28(2), 179–250 (1999).

- McCoy, M., "Industry intrigued by supercritical carbon dioxide as 'green' solvent," *Chem. Eng. News*, 14 June, 11–13 (1999).
- Park, S. J., and Yeo, S. D., "Supercritical extraction of phenols from organically modified smectite," *Sep. Sci. Technol.*, 34(1), 101–114 (1999).
- Poliakoff, M., Meehan, N. J., and Ross, S. K., "A supercritical solvent success story," *Chem. Ind. (London)*, October, 750–752 (1999).
- Reverchon, E., Daghero, J., and Marrone, C., "Supercritical fractional extraction of fennel seed oil and essential oil: Experiments and mathematical modeling," *Ind. Eng. Chem. Res.*, 38(8), 3069–3075 (1999).

## REFERENCES

1. M. S. Ray, "Equilibrium-Staged Separations: A Bibliography Update (1998)," *Sep. Sci. Technol.*, 34(16), 3305–3321 (1999).
2. M. S. Ray, "Equilibrium-Staged Separations: A Bibliography Update (1997)," *Ibid.*, 34(1), 139–156 (1999).
3. M. S. Ray, "Equilibrium-Staged Separations: A Bibliography Update (1996)," *Ibid.*, 32(18), 3067–3083 (1997).
4. M. S. Ray, "Equilibrium-Staged Separations: A Bibliography Update (1995)," *Ibid.*, 32(7), 1163–1187 (1997).
5. M. S. Ray, "Equilibrium-Staged Separations: A Bibliography Update (1994)," *Ibid.*, 30(20), 3723–3745 (1995).
6. M. S. Ray, "Equilibrium-Staged Separations: A Bibliography Update (1992–1993)," *Ibid.*, 29(17), 2359–2385 (1994).
7. M. S. Ray, "Equilibrium-Staged Separations: A Bibliography (1991)," *Ibid.*, 28(6), 1361–1378 (1993).
8. M. S. Ray, "Distillation (1980–1990): A Bibliography," *Ibid.*, 27(1), 105–128 (1992).
9. *Engineering and Applied Science Database* on CD-ROM (including CHERUB chemical engineering database), published by Royal Melbourne Institute of Technology, Australia (ISSN 1038–7900). Full details are available from the author.