(Continued from page 1107)

Effect of fouling on stability of adiabatic packed bed reactors, Ervin, Michael A., and Dan Luss, **AIChE Journal,** 16, No. 6, p. 979 (November, 1970).

Key Words: A. Fouling-6, Catalyst-9, Stability-7, Operation-7, Temperature-7, Reactors-9, Packed Bed-10, Steady State-0.

Abstract: The effect of catalyst fouling on the stability and operation of adiabatic packed bed reactors was investigated for two poisoning mechanisms. The effect of fouling was found to be most predominant for packed beds in which non-unique pseudo steady states can exist. Fouling may cause the reactor to misbehave suddenly with a violent temperature rise, after a long period of pacific operation.

A modified Redlich-Kwong equation for supercritical helium and hydrogen, Vogl, Walter F., and Kenneth R. Hall, **AIChE Journal, 16,** No. 6, p. 985 (November, 1970).

Key Words: A. Redlich-Kwong Equation of State-8, Helium-9, Hydrogen-9, Supercritical-0, Critical Properties-10, Temperature-10, Prediction-4, Compressibility-9.

Abstract: A modified Redlich-Kwong equation of state is developed in which the two parameters are expressed as functions of temperature. The critical values for the two constants in the equation are completely determined by the values of the critical properties of the gas. The optimum values of the constants for each isotherm (Z versus P) are found, followed by a curve-fitting routine that obtains the constants as functions of temperature. The resulting equation of state is used to predict compressibility data of hydrogen and helium.

A modified Redlich-Kwong equation of state, Gray, Ralph D., Jr., Nancy H. Rent, and David Zudkevitch, **AIChE Journal, 16,** No. 6, p. 991 (November, 1970).

Key Words: A. Redlich-Kwong Equation of State-8, Vapor Phase-9, Deviation Function-10, Compressibility Factor-10, Pressure-8, Isothermal-0, Enthalpy-8, Hydrocarbons-9, Alkanes-9, Mixtures-9, Compressibility-8.

Abstract: A new modification of the Redlich-Kwong equation of state is presented. A deviation function (a function of temperature, pressure, and acentric factor) is added to the compressibility factor from the original equation to improve the agreement with data. The purpose of the present modification was to improve predictions of the Redlich-Kwong equation in the saturated vapor region up to the critical point, while retaining a relatively simple form to make analytical relations for derived properties possible. The equation for pressure correction to vapor enthalpy, derived from the compressibility factor by standard thermodynamic procedures, is also presented.

Pore-diffusion mechanisms during vapor phase adsorption, Nemeth, Edward J., and Edward B. Stuart, **AIChE Journal, 16,** No. 6, p. 999 (November, 1970).

Key Words: A. Diffusion-7, 8, Pore-9, Adsorption-8, Nitrogen-1, Silica Gel-1, Multimolecular-0, Temperature-6, Pressure-6, Diffusivity-7, Damkohler Equation-10.

Abstract: The mechanism of diffusion in an adsorbent pore was studier by applying adsorption rate data to the Damkohler equation. Most of the data were taken in the multimolecular region of the nitrogen-silica gel adsorption isotherm. Vapor phase and adsorbed phase contributions to the total transport were separated.

A numerical investigation of free convection between two vertical coaxial cylinders, Schwab, Thomas H., and Kenneth J. DeWitt, **AIChE Journal, 16,** No. 6, p. 1005 (November, 1970).

Key Words: A. Convection-7, 8, Cylinders-9, Annulus-9, Vertical-0, Coaxial-0, Transport Equations-10, Finite Difference Methods-10, Prandtl Number-6, Grashof Number-6, Spacing-6.

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ERRATA

In the paper *Effects of Turbulence on the Drag Coefficients of Spheres in a Supercritical Flow Regime* by Allen Clamen and W. H. Gauvin [15, No. 2 (Mar., 1969)], the following should be corrected.

Page 184
Line 6 of the abstract: the word "tracing" should be replaced by "tracking"

Column 2, line 7: the expression

$$(\sqrt{\overline{u'^2}/U})$$

should be $(\sqrt{\overline{u'^2}}/U)$

Equation (1) should read

$$(N_{Re_c})\ (I_R{}^2) = K$$

Page 186
Equation (3) should be

$$I_R = \sqrt{\overline{u'^2}}/U = (\sqrt{\overline{u'^2}}/U_0)\ (U_0/U) = I(U_0/U)$$

Page 188
Line 10: The name "Rosko" should be corrected to "Roshko"

Equation (6) should read:

$$(\sqrt{\overline{u'^2}}/U)\ (N_{Re_c}{}^*) = 400$$

Equation (7) should read:

$$(\sqrt{\overline{u'^2}}/U)\ (N_{Re_T}) = 1{,}040$$

Page 189
Line 13 of Notation: the expression $\sqrt{\overline{u'^2}/(U_0}$ should be $\sqrt{\overline{u'^2}}/U_0$

Line 14 of Notation: the expression $\sqrt{\overline{u'^2}/U}$ should be $\sqrt{\overline{u'^2}}/U$

Line 5 of "Greek Letters" should read ρ_p = particle density, lb./cu.ft.

Allen Clamen and W. H. Gauvin

In the paper *Maximum Temperature Rise in Gas Solid Reactions* by Dan Luss and N. R. Amundson [15, p. 194 (1969)], the factor 6 should be removed from the left-hand side of Equations (2), (12), (14), (22), from the exponential term in Equation (23), and from the denominator of A and θ in Equation (7).

After these corrections, all the equations and figures in the paper remain valid, but the numerical values of A and θ in the example on page 198 should be modified.

Dan Luss and N. R. Amundson

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Abstract: Free convection between two vertical coaxial cylinders was studied by solving the governing transport equations as an initial-value problem. The coupled, nonlinear, partial differential equations were converted into a set of difference equations by use of an alternating-direction implicit finite-difference numerical scheme. Twenty-four different combinations of Prandtl and Grashof numbers and height to annular spacing ratios, were used to characterize the problem. The results are presented primarily in the form of contour maps for the steady-state isotherms and streamlines.

Numerical treatment of fully developed laminar flow in helically coiled tubes, Truesdell, L. C., Jr., and R. J. Adler, **AIChE Journal, 16,** No. 6, p. 1010 (November, 1970).

Key Words: A. Flow-7, 8, Axial-0, Secondary-0, Laminar-0, Tubes-9, Helical-0, Coiled-0, Velocity-7, 8, Geometry-6, Cross Section-9, Navier-Stokes Equation-10, Digital Computer-10.

Abstract: The Navier-Stokes equations have been adapted to describe fully developed laminar flow in helically coiled tubes. The formulation assumes small helix pitch and thus applies rigorously only to closely wrapped helices. Twelve numerical solutions to a finite difference approximation have been obtained on a digital computer. The solutions have the form of stream function and downstream velocity values at discrete points in the cross section.

Optimal stochastic control of nonlinear systems, Seinfeld, John H., **AIChE Journal, 16,** No. 6, p. 1016 (November, 1970).

Key Words: A. Optimization-8, Control-7, 8, Feedback Control-8, Algorithm-10, Stochastic Control-8, Noise-6, Kalman Filter-10, Continuous Stirred Tank Reactor-4.

Abstract: An algorithm is proposed for the feedback control of nonlinear systems the observations of which are corrupted with noise of unknown statistics. The feedback loop contains a nonlinear Kalman filter, which produces sequential least square estimates of the state of the system, and a controller designed to minimize an instantaneous performance criterion based on the state estimates. The scheme is applied to the feedback control of a CSTR with a first-order exothermic reaction the temperature measurements of which are corrupted with random noise.

Unsteady state behavior of multicomponent distillation columns: Part I. Simulation; Part II. Experimental results and comparison with simulation during start-up at total reflux, Howard, G. Michael, **AIChE Journal, 16,** No. 6, p. 1022 (Pt. I), p. 1030 (Pt. II) (November, 1970).

Key Words: A. Simulation-8, Behavior-8, 9, Unsteady-State-0, Multicomponent-0, Distillation Columns-9, Mathematical Model-10, Digital Computer-10; B. Behavior-8, Unsteady-State-0, Multicomponent-0, Distillation Columns-9, Experimental-0, Benzene-2, Toluene-2, Ethylbenzene-2.

Abstract: In the first part of this paper a very general form of the basic equations for multicomponent distillation columns is presented. These equations allow a wide choice in the form of the specifications of variables required to define the column operation. The effects of different variable specifications on the computer column are discussed. In the second part of the paper, experimental concentration profiles throughout a 14 plate column approaching steady-state at total reflux are obtained for mixtures of benzene, toluene, and ethylbenzene. It was found that the computer model and calculation procedure used could replace the real column for many purposes.

Chromatography of nonadsorbable gases, Cerro, Ramon L., and J. M. Smith, **AIChE Journal, 16,** No. 6, p. 1034 (November, 1970).

Key Words: A. Mass Transfer-8, Diffusion-8, Adsorption-8, Packed Beds-9, Chromatography-10, Gas-9, Non-Adsorbable-0, Catalysts-4, Carriers-4.

Abstract: Chromatographic techniques are used with nonadsorbable and slightly adsorbable tracers to evaluate mass transfer parameters in packed beds. If

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In the paper *Simultaneous Flow and Temperature Correction in the Equilibrium Stage Problem* by John W. Tierney and J. L. Yanosik [15, No. 6, pp. 897-901 (1969)], in Equations (T21) and (17) a negative sign should be added. The correct equations are

$$\mathbf{R} = \mathbf{B}^{-1}\mathbf{A} = (r_{ik}) = -\left(\frac{\partial \mathbf{l}_i^*}{\partial v_k^*}\right) \quad \text{(T21)}$$

$$\mathbf{W}_1 = (w_{1,ij}) = -(r_{ij}\, h_i) \quad (17)$$

John W. Tierney

In the paper *Temperature Gradients in Turbulent Gas Streams* by Wu-Sun Chia and B. H. Sage [16, No. 1, pp. 37-43 (Jan., 1970)], certain errors in five equations were made, and they are shown in the corrected form below:

$$\underline{\epsilon}_m = \epsilon_m + \nu = \frac{\tau g}{\sigma \dfrac{du}{dy}} \quad (2)$$

$$\epsilon_m = \underline{\epsilon}_m - \nu = \frac{g \dfrac{dP}{dx}}{\sigma \dfrac{d^2u}{dy^2}} - \nu \quad (4)$$

$$\underline{\epsilon}_c = \epsilon_c + K = \frac{\mathring{q}}{C_p\, \sigma}\, \frac{dy}{dt} \quad (6)$$

$$\mathring{q} = \mathring{q}_a + \mathring{q}_j \quad (8)$$

$$N_{\underline{Pr}} = \frac{\underline{\epsilon}_m}{\underline{\epsilon}_c} = \frac{C_p\, \tau\, g}{\mathring{q}}\, \frac{dt}{du} \quad (9)$$

B. H. Sage

In the paper *On the Temperature Field of a Square Column Embedding a Heating Cylinder,* by F. S. Shih [16, No. 1, p. 136 (Jan., 1970)], Equation (13) should be

$$q = 8 \int_0^a k_t \left(\frac{1}{r}\, \frac{\partial t}{\partial \theta}\right)_{\theta=0} dr \quad (13)$$

Subsequently, Equations (13*a*) and (14) should read
$q = 8\,(t_a - t_b)$

$$\int_0^1 k_t \left(\frac{1}{R}\, \frac{\partial T}{\partial R}\right)_{\theta=0} dR \quad (13a)$$

and

$$q = 8\, k_t\, (t_a - t_b) \sum_{n=1}^{N} C_n \quad (14)$$

To correct for the change in Equa-

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accurate values of intraparticle diffusivities are to be obtained, it appears that long beds of relatively large particles must be used. Otherwise the moments of the chromatographic peaks are too small for accurate analysis. The method is applicable to all types of porous particles used as catalysts or catalyst carriers.

Effect of fluid viscosity on combined free-forced convection flow phenomena in vertical pipes, Greene, Howard L., and George F. Scheele, **AIChE Journal, 16,** No. 6, 1039 (November, 1970).

Key Words: A. Viscosity-6, Convection-7, 8, Water-9, Sucrose-9, Heating-8, Temperature-8, Velocity-8, Instability-8.

Abstract: Distorted velocity and temperature profiles are measured at low Reynolds numbers for upflow constant flux heating of water and two viscous Newtonian sucrose solutions in a long vertical pipe. Experimental profiles at L/D = 251 show general agreement with the fully developed profile theory based on natural convection effects, but additional profile distortion, attributed at least in part to radial viscosity variation with temperature, is observed even with water.

Compressibilities and virial coefficients for methane, ethylene and their mixtures, Lee, R. C., and W. C. Edmister, **AIChE Journal, 16,** No. 6, p. 1047 (November, 1970).

Key Words: A. Measurement-8, Compressibility-7, 8, 9, Virial Coefficients-7, 8, Methane-9, Ethylene-9, Mixtures-9, Temperature-6, Pressure-6, Equations of State-10.

Abstract: A Burnett-type apparatus was used to obtain the compressibility factors for methane, ethylene and four of their mixtures at 25, 50 and 75°C. Second and third virial coefficients, derived by two techniques, were compared with those from different empirical equations of state. Second virial cross coefficients were obtained.

Experimental and theoretical investigation of continuous flow column crystallization, Henry, Joseph D., Jr., and John E. Powers, **AIChE Journal, 16,** No. 6, p. 1055 (November, 1970).

Key Words: A. Crystallization-7, 8, Separation-7, 8, Crystallizer-8, 9, Column-10, Conveyor-10, Spiral-0, Flow-10, Continuous-0, Position-6, Feed-9, Rate-6, Flow-9, Mathematical Model-10, Benzene-2, Cyclohexane-3.

Abstract: A theoretical and experimental investigation of the separation achieved in a column crystallizer that utilizes a spiral conveyor was conducted to determine the effect of variables associated with continuous flow operation. Several feed mixtures containing less than 31,000 ppm. weight cyclohexane in benzene were employed. The principal variables evaluated in a column of constant length were the feed position, internal crystal rate, and flow rates of terminal streams.

Photodecomposition kinetics of formic acid in aqueous solution, Matsuura, T., and J. M. Smith, **AIChE Journal, 16,** No. 6, p. 1064 (November, 1970).

Key Words: A. Kinetics-7, 8, Reaction Rate-7, 8, Formic Acid-1, 9, Photodecomposition-8, 9, Photochemical Reaction-9, Flow Reactor-10, Differential Reactor-10,

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tion (14), a in the ordinate of Figure 5 must be regarded a dimensionless scale factor, $a = 1.540$. The results are in good agreement with the shape factors determined by electrical analogues [Smith, J. C., J. E. Linde, Jr., and D. S. Lermond, *AIChE J.*, **4,** 330 (1958)].

F. S. Shih

In the paper *On the Relation Between Complex Viscosity and Steady State Shearing in the Maxwell Orthogonal Rheometer* by R. J. Gordon and W. R. Schowalter [**16,** No. 2, p. 318 (1970)], the following correction should be made: $|v_0|$, where it appears following Equation (26) and in Equations (28) and (29), should be changed to $|\gamma_0|$, where $\gamma_0 = \kappa_0/\omega$.

R. J. Gordon

In the paper *Kinetics of Catalytic Cracking Selectivity in Fixed, Moving, and Fluid Bed Reactors* by Vern W. Weekman, Jr., and Donald M. Nace [**16,** No. 3, p. 397 (May, 1970)], Equation (17) should be corrected for a typographical error as follows: the second term within the large brackets should read

$$-\frac{y_1}{r_2}\, e^{r_2/y_1}$$

Vern W. Weekman, Jr.

In the paper *Drag Reduction Correlations* by G. K. Patterson, J. L. Zakin, and J. M. Rodriguez, *AIChE J.*, [**16,** 505 (1970)], Equation (4) should read

$$f/f_{pv} = [1 - (CUT)(\pi/2 - \tan^{-1}(CUT))]^{0.8}$$

The n is changed to a π.

G. K. Patterson

In the paper *The Effect of Property Variations on the Convective Instability of Gases* by D. S. Roja and Bruce A. Finlayson [**16,** No. 5, p. 877 (Sept., 1970)], the following changes should be made.

Reference *15* is missing. It should read

Davis, S. H., and L. A. Segel, *Phys. Fluids,* **11,** 470 (1968).

In reference *16,* the location should read "New Orleans, Louisiana," not Lafayette, Indiana.

Bruce A. Finlayson