# INFORMATION RETRIEVAL

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**The kinetics of condensation polymerization,** Secor, R. M., **AIChE Journal, 15,** No. 6, p. 861 (November, 1969).

**Key Words:** A. Desorption-8, Kinetics-8, Diffusion-6, Finite-Differences-10, Mass Transfer-8, Penetration Theory-8, 10, Condensation-8, 9, Polymerization-7, 8, 9, Reaction Rate-7, 8, Mathematical Model-10.

**Abstract:** The final stages of condensation polymerization are characterized by a rapid rise in molecular weight as the condensation product is formed and diffuses out of the polymer. The process occurring is one of desorption accompanied by a chemical reaction. The penetration theory equations for a generalized condensation polymerization reaction have been solved, and some solutions are presented. The penetration theory solution, obtained by finite-difference computations, is compared with an analytical solution for the special case of no diffusional resistance.

**Single-phase flow through porous media,** Slattery, John C., **AIChE Journal, 15,** No. 6, p. 866 (November, 1969).

**Key Words:** A. Anisotropic-0, Darcy's Law-8, Isotropic-0, Noll-0, Nonoriented-0, Oriented-0, Permeability-10, Porous Media-8, Simple Fluid-10, Viscoelastic-0, Volume-Averaging-8.

**Abstract:** The local volume average of the equation of motion is taken for an incompressible fluid flowing through a porous structure under conditions such that inertial effects may be neglected. The result has two terms beyond a pressure gradient. For a Newtonian fluid with a constant viscosity, the divergence of the local volume-averaged extra stress tensor is proportional to the Laplacian of the averaged velocity vector.

**Combined forced and free convective diffusion in vertical semipermeable parallel plate ducts,** Ramanadhan, Krishnan, and William N. Gill, **AIChE Journal, 15,** No. 6, p. 872 (November, 1969).

**Key Words:** A. Purification-7, 8, 9, Desalination-7, 8, 9, Water-1, 2, Brine-1, Salt-1, 9, Reverse Osmosis-8, 10, Mathematical Analysis-8, Polarization-6, 9, Membrane-10, Mass Transfer-8, Diffusion-8, Series Expansion-10, Free Convection-0, 8, Forced Convection-0, 8, Vertical Conduits-9.

**Abstract:** The effect of natural convection on polarization and flow patterns in liquid phase convective diffusion in a vertical duct with semipermeable membrane walls has been investigated theoretically. It is found that at low flow rates, gravitational fields can play a significant role in distorting the velocity profiles, and thereby they affect the transition from laminar to turbulent flow. Natural convection also significantly affects mass transfer rates and therefore the extent of polarization at low flow rates. Results are presented for both momentum and mass transfer in upward and downward flows for different wall Peclet numbers. The hydrodynamic stability of the system also has been investigated, and critical values of the buoyancy parameters are reported. Also, these results enable one to estimate when natural convection may create errors in membrane testing systems.

The analysis and results are of practical interest in reverse osmosis and other membrane separation processes. The more productive the system, the more likely it will be that buoyancy effects are important.

**Laminar-nonlaminar transition for non-Newtonian flow in annuli,** McEachern, Donald W., **AIChE Journal, 15,** No. 6, p. 885 (November, 1969).

**Key Words:** A. Flow-8, Fluid Flow-8, Estimating-8, Predicting-8, Transition-8, Laminar-0, Turbulent-0, Hanks' Stability Criterion-9, Validity-9, 8, Liquids-9, Non-Newtonian-0, Viscous-0, Viscoelastic-0, Polymer-Solutions-9, 4, Flow Rate-6, Pressure Drop-7, Annulus-9, Conduits-9, Annular-0, Concentric-0.

**Abstract:** Experimental results on the laminar-nonlaminar transition of polymer solutions in axial, isothermal flow in annuli are presented. These data on transition in annuli are compared with predictions made by using Hanks' transition criterion where only viscous effects are considered and where viscous effects are considered and elastic effects accounted for approximately. Predictions were sufficiently accurate to demonstrate technique is applicable.

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found. And, hence, it is not possible to compare the effectiveness of real processes with their ideal (say reversible) counterparts. At least for the engineer, such comparisons are one of the most important applications of thermodynamics.

If, as we believe, part one is the major weakness of this text, then we also believe the last four parts to be its strength, notably part five. Following part four—a brief but adequate treatment of the ideal gas, the van der Waals equation, including phase transformation, a short discussion of liquids and solids, and radiation—the author gives a nice treatment of multicomponent systems. He begins by expanding his four basic postulates to include the increased numbers of independent variables. He continues with chemical reactions. Here the reader will find a good treatment of standard states, heat of reaction, and reaction-equilibrium equations, including activities and the so-called law of mass action. The author couples this nicely to ideal and real gas mixtures, thereby expressing the law of mass action for both ideal and real multicomponent reacting mixtures. The presentation of gaseous reaction equilibrium is concluded with a discussion of the equilibrium constant and its temperature dependence. We believe the treatment will obviate a potential source of difficulty for the student.

The author treats the thermodynamics of solutions rather briefly. In the main he restricts analysis to dilute solutions only, for which freezing point depression and boiling point elevation are examined.

Part six is a brief coverage of a few special topics such as elastic filaments and magnetic and dielectric systems. The body of the text ends with considerations of the thermodynamics of the steady state. Entropy production, the phenomenological equations, and the Onsager theorem are treated, lead-

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## ERRATA

In the paper *Dimensional Considerations in Viscoelastic Flows,* by John C. Slattery [14, p. 516 (1968)], Equations (15) and (16) should read as follows:

$$(\mathrm{T} + p\mathrm{I})^* = \sum_{q=1}^{n} (N_{Wi})^q$$

$$\mathrm{G}_q^*(\mathrm{A}_1^*, \mathrm{A}_2^*, \ldots, \mathrm{A}_n^*) + 0(N_{Wi}^{n+1}) \quad (15)$$

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**Heat transfer to solid-vapor mixtures of cryogens below their triple points flowing through heated tubes,** Jones, M. C., Patricia J. Giarratano, and A. U. Simpson, **AIChE Journal, 15,** No. 6, p. 890 (November, 1969).

**Key Words:** A. Temperature-8, Wall-9, Heat Transfeer Coefficients-8, Mixtures-9, Solid Phase-0, Vapor Phase-0, Parahydrogen-9, Nitrogen-9, Cryogens-9, Cryogenics-8, Tubes-9.

**Abstract:** Data are presented for wall temperatures and heat transfer coefficients for solid-vapor mixtures of parahydrogen and nitrogen flownig in an electrically heated straight tube of length forty times its diameter. These are interpreted by the application of flat plate, constant property boundary-layer theory to models in which the solid particle geometrical distribution takes on simple limiting forms.

**Simultaneous flow and temperature correction in the equilibrium stage problem,** Tierney, John W., and John L. Yanosik, **AIChE Journal, 15,** No. 6, p. 897 (November, 1969).

**Key Words:** A. Calculations-8, Temperature-6, 8, Flow Rate-6, 8, Material Balance-7, 8, 9, Compositions-9, Stages-9, Plates-9, Enthalpy Balance-7, 8, 9, Equations-10, Newton-Raphson Method-10, Equilibrium-9, Two-Phase System-9, Multicomponent-0, Columns-10, Distillation-10, Extraction-10, Stripping-10, Digital Computers-10, Matrices-10.

**Abstract:** Iterative methods for the solution of the steady state equilibrium stage problems are studied. Equations are first developed for calculating the effect of a change in temperature or flow rate on all energy balances, and then it is shown that these equations can be used in the multiple variable form of the Newton-Raphson correction process to correct either the temperatures or the flow rates when only energy balance errors are used. Similar equations for material balance errors which have been developed previously are then combined with the energy balance equations to provide a method for simultaneous correction of the temperatures and the flow rates. Because first-order interactions between flow rates and temperatures are included, the method is applicable to a wide range of equilibrium stage problems. Sample problems are presented, and it is shown that quadratic convergence is obtained for the simultaneous correction process.

**The use of positive feedback control systems to improve reactor performnce,** Gitonde, N. Y., and J. M. Douglas, **AIChE Journal, 5,** No. 6, p. 902 (November, 1969).

**Key Words:** A. Control-8, Positive Feedback-0, Chemical Oscillator-8, Stability-8, 7, Design-8, Optimum-0, Economic-0, Stirred-Tank Reactor-9, Continuous Flow-10, Controllers-9, 10, Mathematical Model-10.

**Abstract:** Positive feedback control systems sometimes can be used to make stable chemical reactors generate periodic outputs. For one set of system parameters the time average conversion obtained from the oscillating reactor was approximately 20% higher than the economic optimum steady state value, and for another case the time average operating cost was approximately 5% lower than that corresponding to the optimum steady state design. A general method for predicting when an improvement can be obtained is presented.

**Thermal instability of a horizontal layer of liquid with maximum density,** Sun, Zu-shung, Chi Tien, and Yin-Chao Yen, **AIChE Journal, 15,** No. 6, p. 910 (November, 1969).

**Key Words:** Thermal Instability-8, Maximum Density-9, Water-0, Bernard Problem-0, Stability Analysis-8.

**Abstract:** An investigation was carried out to determine the onset of convection of a horizontal layer of liquid subject to temperatures of $T_1$ and $T_2$ at lower and upper surfaces, respectively. The liquid was assumed to possess a maximum density value at $T_{max}$ with $T_{max}$ between $T_1$ and $T_2$.

Both rigid-rigid and rigid-free surface conditions were considered. The critical Rayleigh number defined in Equations (20) and (24) is found to be dependent upon two parameters.

Experimental observations on the onset of convection were made and compared with the theoretical results. The experimental work consists of the measurement of melting rate of a block of ice with melting from both below and above. In all cases, excellent agreement between experimental and theoretical results were obtained.

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$$(\mathbf{T} + p\mathbf{I})^* = N_{Wi} \left\{ \sum_{q=1}^{n} (N_{De})^{q-1} \mathbf{G}_q^{**}(\mathbf{A}_1^*, \mathbf{A}_2^{**}, \ldots, \mathbf{A}_n^{**}) + 0(N_{De}^n) \right\} \quad (16)$$

In the discussion of reference 3 in the second sentence on page 517, Equation (32) should be referred to rather than Equation (36).

JOHN C. SLATTERY

The following corrections in *Stability of Numerical Integration Techniques,* [**14**, p. 946 (1968)], should be made:

1. The last term on the first line in Equation (48) should read $\left(\frac{K_{n+1} V_{n+1}}{H_n}\right)$ instead of $\left(\frac{K_n V_n}{H_n}\right)$
2. The term $\left(\frac{L + KV}{H}\right)$ should be removed from the numerator of Equation (54)

G. PAUL DISTEFANO

In *A Thermodynamic Relationship between Integral Heat of Vaporization and Isobaric Equilibrium Vapor-Liquid Compositions* by Luh C. Tao [**14**, p. 989 (1968)], the term $\lambda_i^0(RT_{xb}/p_i^0\Delta v_i^0)$ in Equation (7) should be corrected to $\int_p^{p_i^0} T_{xb}(\partial v_i^{LO}/\partial T)_p dp + \lambda_i^0$.

LUH C. TAO

In *Graphical Calculation of Multiple Steady States and Effectiveness Factors for Porous Catalysts,* by W. E. Stewart and J. V. Villadsen, [**15**, p. 28 (1969)].

$T_{max}$ in Equation (24) and in the notation should be changed to $T_m$. This change is required since the temperature corresponding to $c_A = 0$ may be either a maximum temperature (as in exothermic reactions) or a minimum temperature (as in endothermic reactions).

WARREN E. STEWART

In the paper, *The Surface Rheological Properties of Foam Stabilizers in Nonaqueous Liquids,* [**15**, p. 88 (1969)], the lower curve in Figure 1 should be identified by 3.0 minutes instead of 30.0 minutes, while the middle curve should be 6.0 minutes instead of 60.0 minutes. The upper curve is for 60.0 minutes and is correct as it stands.

R. J. MANNHEIMER