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The aqueous phase oxidation of cyclohexane using gamma-radiation, Ashline, Ronald C., and Robert Von Berg, **AIChE Journal, 15,** No. 3, p. 387 (May, 1969).

Key Words: A. Radiation Chemistry-8, Radiolysis-8, Reaction Kinetics-8, Rate Constants-8, Mathematical Model-8, Oxidation-8, 9, Radiolytic-0, Liquid Phase-0, Cyclohexane-1, Oxygen-1, Cyclohexanol-1, 2, Cyclohexanone-1, 2, Carbon Dioxide-2, Water-5, Gamma-Radiation-10, Radiation Dose-6, Concentrations-7.

Abstract: A study was made of the radiolytic oxidation of cyclohexane in aqueous solution using cobalt-60 gamma-radiation. The major reaction products identified were cyclohexanol and cyclohexanone. A simplified kinetic model based on competition by the various solutes in the system for a single primary radical species produced by radiolysis of the solvent molecules is developed.

Optimization of complex chemical plants by a gradient technique, Lee, E. Stanley, **AIChE Journal, 15,** No. 3, p. 393 (May, 1969).

Key Words: Gradient Technique-8, Lagrange Multiplier-8, Optimization-8, Complex Chemical Plant-4, Multistage Optimization Techniques-8, 10, Recycle System-9, Branching System-9, Programming Techniques-10.

Abstract: The gradient technique and Lagrange multiplier are used to obtain the optimum of complex chemical plants. The advantage of this approach is its ability to handle nearly all types of complex stages in a natural way. This approach is used to solve a heterogeneous complex chemical process with recycle. It is shown that although there are many different iteration loops, the convergence rate is fast even with rough starting values and only 0.3 min. is needed to obtain the optimum operating conditions.

The effects of internal mass transfer on the hydrogenation of benzene over nickel-alumina catalyst, Jiracek, Frantisek, Josef Horak, and Josef Pasek, **AIChE Journal, 15,** No. 3, p. 400 (May, 1969).

Key Words: A. Experimental-0, Reaction Kinetics-7, 8, Catalytic Reactions-9, Hydrogenation-7, 8, Benzene-1, Hydrogen-1, Cyclohexane-2, Recycle Reactor-10, Gas Phase-5, Reaction Order-7, Activation Energy-7, Internal-0, Mass Transfer-6, Diffusion Coefficient-8, Temperature Difference-7, Thermistors-10.

Abstract: The influence of mass transfer on the reaction kinetics, within the porous structure of a catalyst, is investigated during the hydrogenation of benzene. The temperature range for a nickel catalyst at atmospheric pressure is 99 to 160°C. The rate equation and the apparent activation energy on a cylindrical catalyst pellet (4.5 mm. in diameter and 5.5 mm. in height) and on the catalyst particles (0.5 to 0.63 mm. in diameter) are evaluated.
The effect of internal diffusion on the dependence of the reaction rate on the temperature, and on the partial pressures of benzene and hydrogen is satisfactorily explained by means of theoretical relations. The values of the effective diffusion coefficient of benzene are compared by calculating the kinetic data and temperature difference in the cylindrical pellet.

Internal flow mechanism in filter cakes, Shirato, Mompei, Masao Sambuichi, Kato Hiroo, and Tsutomu Aragaki, **AIChE Journal, 15,** No. 3, p. 405 (May, 1969).

Key Words: A. Filtration-8, Filtration Resistance-7, 8, Compressible Cake-9, Differential Equation-6, 7, 10, Relative Solid-Liquid Velocity-8.

Abstract: The definition of filtration resistance is modified by considering relative solid-liquid velocity.
The internal flow mechanism in a filter cake is re-examined in view of the movement of solids during compression. Under conditions of short filtrations (seconds to minutes duration) involving concentrated slurries, the velocity of solids is shown to be comparable to the velocity of the liquid. A differential equation is proposed for flow through compressible cakes in which the pressure gradient is assumed proportional to the difference in average velocities of the liquid and solid rather than to the average velocity of the liquid alone.
An improved definition of the average filtration resistance is developed on the basis of the new flow equation.

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Engineering—An Introduction to a Creative Profession, G. C. Beakley and H. W. Leach, Macmillan Company, New York (1968). 548 pages.

The present book enlarges on an earlier one on the engineering profession and elementary problem analysis. This textbook, for beginning engineering courses, includes a measure of historical and professional information to be conveyed to the young men entering the profession. After this inspirational introduction, it discusses the tools of the engineering student and introduces him to the profession primarily by the problem-solving method. It varies from interesting reading of historical topics, current engineering projects, and gives a goodly number of exercises or small engineering problems. It covers such topics as technical sketching, how to study, the slide rule, and spoken and written communication. The concluding part includes decision processes, design and optimization. The book abounds in pictures and illustrations and is attractive to the reader. It can be a good vehicle to introduce students to engineering.

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