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Quantitative Characterization of Catalytic Activity

By G. K. Borieskov
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It is expedient to express activity of a catalyst as a function of the rate of change of a reaction over it. For homogeneous catalyses the amount of catalyst participating in a reaction is given in terms of its concentration in the system, whereas for heterogeneous catalyses this is expressed as the area per unit weight. The following precautions must be observed in determining reaction rates: (1) the effects due to heat and material transfers must be excluded and (2) a correction due to reversibility of a reaction at the conditions employed must be introduced.

A classification of methods to determine catalytic activity is included and the advantages of a continuous flow method at near-ideal mixing conditions (a non-gradient method) are demonstrated.

Modeling of Contact Processes

By M. G. Sleenko
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Investigated were both physical and mathematical methods of modeling contact processes. The results show that in majority of cases physical modeling is not applicable. Generalizations from experimental data are justifiable only on the basis of a detailed study of the physical and chemical principles of individual stages of a process. But description of a model of a process by a system of mathematical equations is possible only in presence of such well-defined data.

Present a tabulation of contact processes and cite examples of mathematical models to determine stability of exothermal processes and the optimum conditions for conversion of butylene to sulfur trioxide, ethylene oxide, and divynil.

Essential Data for Reactor Design Using the Method of Dynamic Programming

By L. M. Peesmien and J. J. Yoffey
Scientific Research Institute for Organic Intermediates and Dyes

Review fundamentals of the method of dynamic programming to calculate optimum conditions for chemical reactions. Point out the advantages of the analytical version of this method as compared to the exploratory one. Define the extent of experimental information essential for reactor design calculations using the preferred method.

Literature Data As an Aid in Catalyst Selection

By O. V. Krilov
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Present a review of published information covering catalytic activity of binary compounds in oxidation of CO and dehydrogenation of isopropyl alcohol. Statistical processing of this information shows that the relationship between catalytic activity of the elements in the compounds used and their position in the Periodic System is regular, rather than accidental. As a result, activity of many untried substances can be predicted qualitatively.

Non-Gradient Methods for Determination of Reaction Rates

By M. I. Tiomkin
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Utilization of continuous flow and static methods to determine reaction rates involves over-simplified assumptions which are not always justifiable. Mathematical analyses of the results so obtained are frequently difficult.

On the other hand, determination of reaction rates at fixed non-gradient conditions yields directly the reaction rate date which are comparable to the rate data calculated by use of kinetic differential equations. In addition to accuracy, the non-gradient methods have a number of other advantages.

Several designs of non-gradient reactor systems are examined, with particular attention to various modifications of recycle-continuous schemes, as a general means to bring about non-gradient conditions in the reactors of heterogeneous catalytic systems.