Using as the model a bed of spherical particles which touch each other at one point only, the authors discuss the relationship between the strength of the particles and the degree of dispersion, porosity, nature of the surface contacts, and the internal arrangement. The authors emphasize that the hardness of granular catalysts—to meet industrial specifications—can be increased only at a sacrifice in the adsorptivity. Possible ways to increase physical hardness of particulated catalysts are discussed, such as vibro-compacting, use of crystallization methods to control the structural strength, and use of the carriers with skeletal structures making them inactive adsorption-wise to a specified environment.

Chelates of o-Quinone—With Cu(II) and Fe(III) Acting as Hydroxylators and Oxidators. Organic Catalysts: Catalytic Activity of o-Quinones

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A kinetic equation is given for catalytic oxidation of pyrocatechin in presence of Cu(II) and Fe(III) chelates. This equation is based on the kinetics, material balances, and spectrophotometric data. Comparative rates of separate steps of the process are shown. The catalytic oxidation mechanisms of the Cu(II) and Fe(III) chelates are different and involve different rate-determining steps.

The same substituents in position 8 of the moiety of 1,2-naphtoquinone exert different effect on the activity of the Cu(II) and Fe(III) chelates. The Fe(III) chelates are more selective and may be regarded as oxidases, i.e. they are oxidators. On the other hand, the Cu(II) chelates are less selective: along with the dehydrogenation activity, they also cause extensive oxidation of the substrate. Consequently, they may be regarded as hydroxylases, i.e. they are hydroxylators.

Electrochemical Methods to Determine the Mechanism of Catalytic Hydrogenation in Solutions

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In hydrogenation of unsaturated hydrocarbons in solutions, the relative concentrations of the reactants on a catalyst surface can be determined by electrochemical methods. The quantities of adsorbed hydrogen, the average energy of its bonding with a catalyst surface, and the magnitude of the surface, by itself—are determinable with the aid of a system of electrical charge curves, which are based on the results of determinations of anodic polarization of the catalysts by electric current, oxygen, or by use of a mixture of an unsaturated hydrocarbon and an inert gas. The method is particularly sensitive as a means to distinguish between the radical and ionic types of reactions.

Mechanism and Kinetics of Liquid Phase Oxidation of Metacrolein to Methacrylic Acid

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A study of kinetics of oxidation of metacrolein in liquid phase shows that in presence of salts of the metals with variable valence characteristics, the reaction proceeds chiefly via the radical-chain mechanism. The free radicals formed in the process initiate both the oxidation of the metacrolein and the subsequent polymerization of the methacrylic acid produced in the preceding step.

Over a silver catalyst, oxidation of metacrolein occurs by a different mechanism—mainly, of a non-radical type.

Kinetics of Oxidation of α-Naphthylamine by a Bromate in Presence of Molybdenum (VI) Catalyst

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Oxidation of α-naphthylamine by a bromate was studied in an acidic medium. The results show that the reaction is accelerated by the reaction product, quinoneimine. The reaction is catalyzed by molybdenum in very small concentrations, the catalysis occuring only in presence of the reaction product. Kinetic equations are derived for the non-catalyzed reaction.

Kinetic Parameters of Dehydrogenation of Isopropyl Alcohol and Tetralin and Dehydration of the Alcohol Over a Praseodymium Oxide Catalyst

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Over a praseodymium oxide catalyst, the values of the true activation energies of dehydrogenation of isopropyl alcohol and tetralin and of dehydra-