Use of Adsorption Calorimetry in Studying the Oxidation of Hydrogen on Silver

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The author has studied the reactions: (1) $O_2 = 2O_{(adsorb.)}$ and (2) $H_2 + O_{(adsorb.)} = H_2O$, which he regards as stages of the overall reaction $H_2 + \frac{1}{2}O_2 = H_2O$ (2′). The latter is a steady-state process in the presence of silver. The author measured the rates of the above reactions at 110°C, and at the same time determined their respective heats (Q_1 and Q_2) as functions of the quantity (Γ) of the oxygen adsorbed on the silver. The data are interpreted on the assumption that the surface contains sites $(Ag_2O)_{surf.}$ and $(AgO)_{surf.}$ [or $(Ag_2O_2)_{surf.}$], whereby the oxygen-silver bond is stronger in the $(Ag_2O)_{surf.}$ sites. A rate equation for reaction (2′) is proposed; this reaction becomes first order with respect to hydrogen at $[H_2] \gg [O_2]$. The rate constants of reactions (1) and (2) were also calculated. The rate of reaction (3), calculated from the rates of stages (1) and (2), is of the same order of magnitude as the experimentally determined rate.

Kinetics of the Reaction of Methane with CO_2 over Nickel

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The rate of the reaction of methane with CO_2 over nickel between 800° and 900°C ($P_{CO_2}/P_{CH_4} \gg 1$) can be described by an equation identical to that previously found for the reaction of CH_4 with steam. This is because CH_4 does not react with CO_2 but with H_2O; here, the nascent hydrogen immediately reacts with the CO_2 (water-gas reaction) to reform the H_2O.

Terbium Oxide as Catalyst for Dehydrogenation and Dehydration of Alcohols and Dehydrogenation of Tetralin

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The authors studied the reactions of ethyl, *n*-propyl, isopropyl, *n*-butyl and *tert*-butyl alcohols, as well as those of tetralin over terbium oxide. The activation energies for dehydrogenation and dehydration of alcohols and dehydrogenation of tetralin thus found were used to find the bond energies between the terbium oxide surface and the elements comprising the organic molecules.

Oxidation of Cumene on Copper Phthalocyanin

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It is shown that the changes in the activity of the Cu-phthalocyanin catalyst during decomposition of α-cumyl hydroperoxide into free radicals are related to changes in the crystal lattice of the catalyst. The authors used ESR spectra and optical methods to study the reaction of the hydroperoxide with sulfonated phthalcyanin (in solution).

Kinetics of Hydrogenation of Benzene over Nickel Catalysts in a Nongradient System. Part I.

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The authors studied the hydrogenation of benzene in a recirculatory flow reactor, and used a catalyst consisting of nickel on a zinc substrate. The conditions were such that the reverse reaction was also possible. The temperatures were 215–270°C; the partial pressures in the feed mixture were, respectively, 300–760 mm for H_2 and 50–190 mm Hg for the C_6H_6; and space velocities were varied over a wide range. The reaction rate is independent of the concentration of cyclohexane (which was added to the mixture to check this factor), and is described by $\omega = kP_{C_6H_6}{}^{0.5}P_{H_2}{}^{3}$. If the stoichiometric factor is 1, this equation also describes the reverse reaction. The results are interpreted from the point of view of the theories of reactions proceeding on heterogeneous catalytic surfaces.

Coordination of Pentavalent Chromium and the Activity of Chromia Catalysts in Ethylene Polymerization

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The authors have studied the ESR and optical reflection spectra of chromia on various substrates. These catalysts are used for polymerization of ethylene. It appears that on silica gel, the coordination of Cr^{5+} is tetrahedral. On aluminum silicate and alumina, the coordination of Cr^{5+} is both tetrahedral and that of a shortened octahedron. The authors think that the activity of these catalysts is related to the tetrahedral coordination.