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Hydrogen Atom Concentration in the Near-Exhausted Zone of Hydrogen Flame

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Concentration of atomic hydrogen in a near-exhausted zone of hydrogen flame was determined by the EPR method. The effect of reaction conditions upon the concentration was also determined. A comparison is presented between the experimental results and the data calculated from the reaction kinetics for oxidation of hydrogen. Show that for combustion mixtures with less than 80% hydrogen content the atomic hydrogen concentration values, as calculated by use of simplified equations which do not account for the wall effect of recombination of the hydroxyl radicals, are greater than the actual values. The wall recombination rate constant of the hydroxyl radicals was also evaluated.

Reaction Kinetics of m-Chlor-Aniline and Benzoyl Chloride from Mixtures with Benzene and Pyridine

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A study was made of the kinetics of benzoylation of m-chlor-aniline in benzene containing small admixtures of pyridine (0.005 to 0.1 mole/liter). Pyridine was found to be an effective catalyst for this reaction. The pyridine hydrochloride formed in the process also accelerates the principal reaction. Thus, the benzoylation from mixtures of benzene and pyridine is autocatalytic. Consequently, the observed rate of reaction in presence of a mixed solvent is the sum of the reaction rates of two simultaneous catalytic reactions and of one noncatalytic reaction. Methods were developed to calculate the reaction rate constants for each of the three reactions.

Catalytic Oxidation of Ethylene in Presence of Aqueous Solutions of Palladium Salts

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In presence of aqueous solutions of the salts of palladium and copper, ethylene is oxidized to acetaldehyde. The process includes the following stages: (1) formation of an ethylene-palladium salt complex; (2) internal conversion and hydrolysis of the complex with accompanying separation of acetaldehyde; (3) oxidation of the zero valence palladium, formed in the preceding stage, by a divalent copper salt of the complex; (4) oxidation by oxygen of the cuprous oxide salt from Stage 3 to form the corresponding cupric oxide salt.

Formation of palladium metal by decomposition of the Pd°-complex is a side reaction. This reaction brings about stoppage of the catalytic process. Thermodynamic analysis shows that the equilibrium in Stage 3 depends upon stability of the reacting solutions. A mechanism is proposed to explain inhibition of the reaction by the H^+ and Cl^- ions. Retardation of the reaction with increasing concentration of Pd^{2+} in the complex is, apparently, due to the slow-down of Stage 1. Simultaneously, stability of the reacting solutions increases. Selective complexing of Cu^{2+} intensifies the process due to acceleration of the reactions in Stages 3 and 4; on the other hand, a nonselective complexing of this ion, and to some extent also of the ions Pd^{2+} and Cu^+, retards it.

On the basis of the experimental and theoretical data, propose a number of optimum processing parameters and types of complex-forming ligands to accelerate the reaction. Present conclusions concerning the controlling stage of the process, which is either Stage 3 or 4.