### Study of Mechanism of Cumene Oxidation in Liquid Phase by Inhibition Technique: Chain Initiation

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In oxidation of cumene, the rate of radical initiation is proportional to the hydroperoxide concentration of up to 0.5 mol/l. At more severe oxidation conditions, a degenerative branching occurs with participation not only of cumene but also of its oxidation products.

With pure cumene, chain initiation follows the reaction, $2RH + O_2 \rightarrow 2R + H_2O_2$. Its energy of activation is $15 \pm 1$ kcal/mol.

### Effect of Additives on Physico-Chemical Properties of Silver Oxalate, Photolysis, Radiolysis and Thermal Decomposition of Silver Oxalate

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This investigation covered the effects of adding $Cd^{++}$ and $Pb^{++}$ ions on the rates of photolysis and radiolysis of silver oxalate. The results show that in thermolysis, photolysis, and radiolysis reactions, the initial effect of the additives to retard the reaction rates tends to change to the rate-accelerating effect. Quantitatively, the transition to the acceleration is greater in presence of the $Pb^{++}$ than the $Cd^{++}$ additive.

The effect of these additives on the course of the individual elementary stages of $Ag_2C_2O_4$ dissociation reaction is also considered, taking into account the results of this study and the earlier information on electrical and optical properties of the $Ag_2C_2O_4$ with added $Cd^{++}$ and $Pb^{++}$.

The concepts advanced to explain the causes of the observed effects are supported by th EPR spectral analyses of the irradiated solid solutions.

### Effect of Active Solids on Reaction Kinetics: Oxidation of Iron by Water

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The kinetics of oxidation of iron by water were studied, using three samples of fused iron catalysts which differed mainly in $Al_2O_3$ content.

Based on the earlier-described method to characterize the reaction kinetics of solid substances, the results of this study show that the three samples have practically the same oxidation reactivity. The only effect of the added $Al_2O_3$ is to increase the specific surface of the catalysts. As a result, the concentration of the product-generating surface defects increases.

The pretreatment with $CO_2$ of the catalysts containing small amounts of $Al_2O_3$ increases the activation energy of the Fe oxidation.

### Properties of the Surface Defects in Irradiated Silica Gel: The Mechanism of Hydrogen Adsorption

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The structure of the surface centers of irradiated samples of silica gel was determined with the aid of optical and EPR spectral analyses, the distinctive coloration of the centers—due to admixed aluminum—facilitating their identification.

The centers are positively charged holes stabilized by the oxygen atoms adjacent to the atoms of the admixed aluminum. These defects are the centers responsible for irreversible adsorption of hydrogen.

### Surface Ionization of Toluene Over Oxidized Molybdenum

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A study of surface ionization of toluene over a heated diode of oxidized molybdenum was carried in a continuous flow unit. The correlations obtained agree well with the hypothesis which explains surface ionization of organic molecules as a process of ionization of the radicals formed by chemical conversion of molecular reactants. The data on the surface ionization of organic molecules may be helpful in determining reaction kinetics.

### Some of the Problems of the Physico-Chemical Theory of Ruggedness of Finely-Dispersed Porous Solids, Catalysts, and Sorbents

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Some of the fundamental problems are discussed to determine the mechanics of porous structures, the ruggedness of finely-dispersed solids —in terms of the physico-chemical theory, and the design of mechanical test methods.