Study of Catalytic Hydrogenation of 3-Sulfolene

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Hydrogenation of 3-sulfolene was studied over a nickel-chrome catalyst of high selectivity. Series of correlations were established between several kinetic variables of the reaction. It was found that in hydrogenation of sulfolene the catalyst retains its initial activity over long periods of time.

Structure of Some Silicate Catalysts

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The structures of silica-alumina, silica-zirconia and silica-magnesia catalysts were determined by the x-ray and infrared spectroscopy methods. The aluminum in the silica-alumina catalysts exhibits four- and six-coordinated configurations. An amorphous chemical substance and a solid solution are formed by the silica-zirconia. The silica-magnesia catalyst contains a crystalline phase resembling talcum and after treatment in an autoclave it forms a crystalline phase of near-serpentine configuration.

Catalytic Properties of Titanium Dioxide and of Its Solid Solutions

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Catalytic decomposition of isopropyl alcohol was studied over TiO_2 and over its solid solutions in WO_3 and in Fe_2O_3. These catalytic substances differ from each other in both the electrical conductivity and in activation energy.

Decomposition of the alcohol is primarily by dehydration. A correlation was found to exist between the electrical and catalytic properties. An electronic mechanism is proposed to explain the process of dehydration of isopropyl alcohol.

Effect of Calcination Temperature Upon Catalytic Activity of Oxides of Rare Earth Elements

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An evaluation was made of catalytic activity of a number of rare earth metal oxides for oxidation of CO. The kinetic oxidation curves for the oxides of metals with variable valency values exhibit a plateau. A correlation exists between pretreatment temperatures and catalytic activity of the oxides of lanthanum, dysprosium, and neodymium.

Differential Heats of Adsorption and Isotherms of Some Alkanes and Naphthenes on Silica Gel

By A. V. Keesielyov and B. A. Frolov

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The adsorption isotherms and differential heats of adsorption of 2,2,4-trimethyl pentane, cyclopentane, cyclohexane, and methyl cyclopentane were determined, using an adsorption calorimeter equipped with a heat-exchanger to maintain a constant temperature of 20°. The silica gel used had large pores and hydrated surface. The areas occupied by the various adsorbate molecules in the dense monolayer at the surface of each adsorbent were evaluated for each adsorbent from the unit surface area values corresponding to the various packing configurations of the molecules of Van der Waals' dimensions. At small pore-fillage values of the adsorbates of equal number of carbons per molecule, the adsorption and heat of adsorption values decrease in the following order: n-alkanes $>$ isoalkanes $>$ naphthenes. In all cases, the net heats of adsorption are exceedingly small, especially for isooctane and the cyclo-alkanes. For this reason, the transition from the predominant adsorption in the primary layer to a polymolecular adsorption and condensation occurs gradually.

Heats of Adsorption and Isotherms of Vapors of Some Aromatic Hydrocarbons on Silica Gel

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The adsorption isotherms and differential heats of adsorption of the vapors of benzene, toluene,

ethyl benzene, isopropyl benzene, m-xylene, p-xylene, and 1,3,5-trimethyl benzene were determined for a hydrated surface of a large-pored silica gel. The apparatus used was an adsorption calorimeter equipped with a heat exchanger to maintain a constant temperature of 20°. Evaluation of the area occupied by the molecules of each of these hydrocarbons in the dense monolayer was made on the basis of their Van der Waal's values and the possible packing configuration. For the hydrocarbons with the same number of carbon atoms per molecule, the heats of adsorption of alicyclics on the hydrated surface of silica gel differ very little from those of the normal hydrocarbons but are appreciably smaller than of the aromatics. Compared to the corresponding heats of adsorption on a graphitic carbon black, the heats of adsorption on a hydrated surface of silica gel are smaller with normal alkanes and larger with aromatics. The higher heat values in the latter case are due to the additional effect (in addition to the electrokinetic, dispersional, interaction) of interaction of, principally, the pi-electron bonds of the aromatic ring with the hydroxyl groups of the silica gel. Consequently, the mobility of adsorbed aromatic molecules is appreciably smaller on the hydrated surface of silica than on the surface of the carbon black.

A Dynamic Method for Determination of Specific Surfaces of Adsorbents by Continuous Adsorption from a Solution Stream

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The dynamic method proposed earlier, to determine surface areas and structure of adsorbents in continuous contact with a solution stream, is also applicable to the study of adsorbents with wide pore size ranges. A comparison is presented between the settling area values of phenol molecules as determined by adsorption of phenol (from its solution in carbon tetrachloride) on the standard silica gels with those calculated from the possible configurations of variously oriented molecules with van der Waals' dimensional properties. Based on the comparative settling area values, a hypothesis is proposed regarding the orientation effect of the hydroxyl group upon the molecules of phenol on the adsorbing surface.

Application of Infrared Spectroscopy to Study of Natural Sorbents

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The infrared spectra in the range of 400 to 5,000 cm^{-1} were obtained for several natural sorbents as well as for silica gel, montmorillonite and kaolinite. An attempt is made to explain the characteristic bands present in the infrared spectra of natural sorbents. The possibility to use infrared spectroscopy is noted in studying the adsorption mechanism of natural sorbents as well as of the structural peculiarities of complex polymineral compounds, such as the natural sorbents.

Glass Cell With Conductive Walls for Determination of Contact Potential Differences

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A simply and easily constructed glass cell with a conductive surface covering is proposed for measuring the electronic work function at temperatures of 20° to 600°. The reference electrode can be preheated to a temperature up to 450° and the samples, which can be measured in either an oxidizing or a reducing atmosphere, can be heated to a temperature up to 900°. The reproducibility of the work function values obtained is within 0.01 volt.