

Activation and Ageing of a Chromium Oxide-Iron-Zinc Catalyst in a Full-Scale Commercial Reactor

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The authors have studied the activities and ageing of an industrial chromia-iron-zinc catalyst for the dehydrogenation of butylenes. They showed that 72% of the fresh catalyst consists of very fine spinel particles. Activation involves formation of a relatively stable crystalline lattice with high internal surface, while ageing involves crystallization with sintering, which results in lower specific surface.

The life and the required quantity of the catalyst depend on the specific surface which the catalyst retains following activation, and the rate at which this surface decreases during operation. The initial specific surface depends on the preparation technique, but after that it is a function of the activation and operating temperatures. Some recommendations for increasing the life of the catalyst are given.

Effect of Surface Conditions and Volume of TiO₂ on the Dissociation Adsorption of N₂O

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Partial reoxidation of reduced TiO₂ gives an "oxidized layer" on the surface; anionic holes in the latter affect the adsorption of N₂O. In samples with thermally induced defect structure, even an insignificant quantity of oxygen inhibits the adsorption of N₂O. This is apparently due to the fast disappearance of anionic holes from the surface. The latter are more active in N₂O adsorption than the interstitial Ti⁴⁺.

Charging of Surfaces of Oxidation Catalysts during Adsorption of Mixtures of Propylene and Oxygen

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Studies of charging of surfaces of several oxidation catalysts during chemisorption of mixtures of propylene and oxygen revealed differences in the behavior of gases, depending on whether the catalyst is a mild one or whether it produces extensive oxidation. The authors suggest that the oxidation proceeds via oxygen-hydrocarbon com-

plexes. These bear a positive change in the case of a mild catalyst, and a negative one in the case of extensive oxidation catalysts.

Comparison of Various Chromatographic Techniques for Determining the Specific Surfaces of Solids by Argon Adsorption

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The various presently used techniques have been compared. The calculations of the surface based on the retained volume or on the isotherm calculated from the distorted side of the chromatogram are useless at low temperatures because of poor accuracy. Both thermal desorption and frontal analysis allow measurement of surfaces by argon adsorption regardless of the porosity of a given solid. However, thermal desorption is preferable.

Preparation of Silica Gels with Predetermined Porous Structures

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The theory of formation of silica gel structures is presented. The factors governing the nature of the porous structure are characterized in terms of their influence on the size and packing density of particles constituting that structure. Based on the above, the authors show the various ways of obtaining silica gels of predetermined geometrical structure.

Internal Diffusion Effects in the Pulse-Chromatography Mode of Operation of a Reactor

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The authors analyze first-order heterogeneous catalytic reactions proceeding under conditions of pulse chromatography, where the gas diffuses into the pores. They show that this diffusion, operating in conjunction with the chemical reaction, reduces the average residence time of unreacted molecules in the reactor, as well as the width of the chromatographic peak. The authors studied the adsorption and diffusion of butane through the pores of a chromium-aluminum catalyst at 90°–154°C. In this range, chemisorption is not the rate-controlling step. The effective coefficient of dif-