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Some of the Problems of Kinetics and Reaction Mechanism in Heterogeneous Catalytic Oxidation of Organic Compounds

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The kinetics and reaction mechanism were investigated for the process of heterogeneous catalytic oxidation of organic substances. The effects of the following processing variables were determined:

- (1) Manner of initial attack of a molecule;
- (2) Relationship between the reaction and the desorption rates;
- (3) Phase changes in the catalyst.

The possibility to carry out heterogeneous reactions of this type in liquid phase is also noted.

Modification of Catalysts for Oxidation of Hydrocarbons

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An investigation was made of the effects of great many additives upon the working process yields and activity of metal and semiconductor catalysts (silver and copper oxide). The modifying additives with electronegative values, ϵ , greater than the ϵ value of the catalyst decrease its activity and, at the same time, increase the work function, and selectivity of oxidation of ethylene and propylene. It was demonstrated that for mixed catalysts, $MnO_2-Bi_2O_3$ and $WO_3-Bi_2O_3$, the selectivity and the electronic work function correlate with catalyst composition.

Modifying Effect of Additives on Performance of Ethylene Oxidation Catalysts

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A study was made of the modifying effect of S, Se, Te and Cl on a silver catalyst for oxida-

tion of ethylene, using a radiochemical method. In each case the optimum activity was found to lie in the modifier concentration range which corresponds to small coverages of the catalyst surface. Data were obtained on the modifier distribution within the catalyst and on its surface and on their volatility to the gaseous phase.

The changes in activity of the catalyst due to the added modifiers are attributed to a change in the bond energy of adsorbed oxygen.

Investigation of Phase Composition of Mixed Vanadium Catalysts for Oxidation of Aromatic Hydrocarbons

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This investigation covered a study of phase compositions of fresh and spent catalysts, comprising mixtures of oxides of vanadium and molybdenum and of vanadium and chromium, and of their activity for oxidation of benzene to maleic anhydride. It was demonstrated that the composition of a vanadium-molybdenum catalyst of optimum activity approaches that corresponding to the limiting solubility value of MnO_2 in V_2O_5 in solid solution. In a number of cases spent catalysts were found to have formed two-phase oxide systems. The effect of the additives on the rate of catalyst regeneration by the reaction media was also determined.

Effect of Method of Preparation of Silver on Its Specific Activity in Oxidation of Ethylene

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An investigation was made of the effect of method of preparation of silver on its specific catalytic activity for oxidation of ethylene. It was demonstrated that the instability in specific activity of silver which occurs when recovering this metal by various methods, is caused by a change in chemical composition of the catalyst surface as a result of contamination with micro-