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LETTERS TO THE EDITOR

Nature of Active Sites on an Fe-Mo Catalyst for Methanol Oxidation

Attention has recently been drawn to the study of the nature of active sites on Bi-Mo catalysts for butene oxidation (*1*). In a similar study of the mechanism of the catalytic methanol oxidation on an $Fe_2(MoO_4)_3$ catalyst we found that this Fe-Mo catalyst adsorbs and irreversibly binds pyridine to a comparable extent as an acidobasic Al-Si catalyst (*2*). As the irreversibly adsorbed amount of pyridine (Table 1) we always selected that amount

TABLE 1
PYRIDINE ADSORPTION ON FE-MO CATALYST
($p_{pyridine}$ = 4.3 mmHg)

Catalyst	Pyridine adsorption at 20°C, μmole/m²	Irreversibly bound pyridine, μmole/m²	
		20°C	100°C
Fe-Mo catal.	10	4.7	2.7
Al-Si catal. (2)	6.5	2.3	0.4

which remained bound on the surface at 20° or 100°C after the sample had been pumped on for 1 hr at the same temperature. We found that preadsorbed and irreversibly bound pyridine in a characteristic way influences the heat of adsorption of reacting molecules (CH_3OH or O_2) and the composition of products after interaction of methanol with Fe-Mo catalysts. The heat of oxygen adsorption at 20–100°C (estimated by means of a chromatographic method) on an Fe-Mo catalyst drops after pyridine preadsorption from 18 kcal/mole to 6 kcal/mole. After pyridine preadsorption no products of deep methanol oxidation (CO, H_2O) are formed any more at 100°C in a static apparatus. The catalyst becomes practically inactive. These results support our earlier conceptions (*3*, *4*) that the activation of reacting molecules in the mechanism of methanol oxidation in the presence of an Fe-Mo catalyst proceeds on special types of active sites which act in a way similar to active sites of an acidobasic Al-Si catalyst.

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