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Adsorption of alkanes on isomerization catalysts

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Zirconia modified with sulfate is a potential catalyst for the isomerization of *n*-butane to *i*-butane. The number of adsorption sites for small alkanes and the respective differential heats of adsorption on zirconia samples are thus of interest. In order to study the adsorption of propane, *n*-butane, and *i*-butane on a series of zirconia catalysts including partially deactivated samples, SETARAM MS-70 calorimeters were coupled with a volumetric system. At 313 K and an equilibrium pressure of 5 mbar, typically 10 to 100 μmol alkane per g catalyst were adsorbed. The majority of the sites on the materials were similar, with heats of adsorption between 40-60 kJ mol^{-1} , only a small number of sites at coverages $< 2 \mu\text{mol g}^{-1}$ was different. A number of interesting phenomena occurred: 1. For particularly active catalysts, the heats of adsorption of *i*-butane and *n*-butane increased with increasing coverage. 2. The adsorption was occasionally followed by secondary reactions. 3. After hours of constant pressure, a spontaneous, but slow uptake of sorptive with considerable heat evolution was observed.

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