

## Characterization of Surface Sites Using IR-Spectroscopy & Microcalorimetry



*Friederike C. Jentoft*



IR spectroscopy is frequently employed to study surface functionalities of catalysts. Sites that do not give rise to vibrations themselves can be investigated via the adsorption of probe molecules. The best probe molecule may often be the reactant itself. The available equipment at FHI will be presented, and the power of the probe molecule approach will be illustrated by two examples:

1. Catalysts consisting of Pt supported on H-Mordenite are industrially employed for the hydroisomerization of *n*-pentane. We compared catalysts calcined at different temperatures to each other and with Pt-free Mordenite. CO was employed as a probe for Lewis acid and Pt sites and *n*-butane was used as a representative of alkane reactant. In a separate experiment that mimicked the IR experimental conditions the adsorption of butane was also followed by microcalorimetry.

2. SiO<sub>2</sub>-supported Ag is a catalyst for the selective hydrogenation of  $\alpha$ ,  $\beta$  unsaturated aldehydes to the corresponding unsaturated alcohols. It is not known how and at which sites hydrogen is activated. We have followed the reaction of H<sub>2</sub> and D<sub>2</sub> with the pure support SiO<sub>2</sub> and a 9 wt% Ag containing catalyst at temperatures between 373 and 525 K using IR-spectroscopy. The OH-groups of the silica exchanged with D<sub>2</sub> to give OD-groups. The kinetics of this reaction were investigated, as were the kinetics of the back-exchange reaction with H<sub>2</sub>.