In situ Synchronous XAFS/DRIFTS Study of CO Adsorption on Al_2O_3-Supported Pt

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The research on oxide-supported catalysts is a rapidly growing area due to their broad industrial applications. The interaction between Al_2O_3-supported Pt catalysts and hydrocarbons or CO has been extensively investigated by various techniques such as XPS, FTIR and XAFS. Here, we present an *in situ*, multi-technique study of this model catalyst system using a recently-developed setup at the beamline X18A at the National Synchrotron Light Source, Brookhaven National Laboratory. The setup combines two complementary techniques, the X-ray Absorption Fine-Structure (XAFS) Spectroscopy and Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS). Such system of combined XAFS / DRIFTS for the dynamic "*operando*" conditions allows simultaneously probing the structure and electronic properties of the catalysts under operating conditions (high temperatures, up to 800 °C, and pressures, up to a few atmospheres) as well as the interaction of catalysts with adsorbates in real time. The new opportunities afforded by this setup for combined mechanistic and kinetic studies of chemical reactions are well illustrated by the case of CO adsorption on 5 wt% Pt supported on Al_2O_3. The dynamic behaviors of the catalyst (5% Pt-Al_2O_3) and the adsorbate molecule (CO) are followed and analyzed simultaneously under *in situ* conditions. The marriage between these two complementary spectroscopic techniques offers new opportunities in research of a large class of important catalytic reactions.