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Cluster size effects on chemical and physical properties of model catalysts

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Model catalysts are prepared by deposition of size- and energy-selected metal clusters on well characterized solid supports in an ultrahigh vacuum system. The system provides capabilities to probe the physical properties of the samples by X-ray and ultraviolet photoelectron spectroscopy (XPS, UPS), ion neutralization spectroscopy (INS), and low energy ion scattering (ISS). The chemical properties can be probed by a variety of pulsed, temperature-programmed, and constant temperature mass spectrometric methods, and resulting changes in physical properties from interactions with adsorbates are probed by XPS, UPS, INS, and or ISS. Recently, capabilities for in situ electrochemical characterization were added. Results from several systems will be presented, including gas-surface reactions over Pd/alumina and Pd/titania, and solution phase oxygen reduction over Pt/glassy carbon.