

Important applications and multiple capabilities of open user XPS facility at University of South Carolina in study of catalysis

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Abstract

As a powerful technique, XPS is widely used to characterize surfaces and interfaces of catalytic systems. This poster will present this important application of Kratos Axis Ultra DLD XPS facility by showing several practical studies in catalysis. The XPS facility located at the University of South Carolina is quipped with a monochromatic Al K α source and a high resolution energy analyzer, which provide a resolution as high as 0.45 eV and a high sensitivity. Additionally, the system is provided with a catalysis cell, which allows samples to be treated at a temperature less than 1000 C and at high pressure to several atmospheres of gases, such as O₂, H₂, CO, and so on. The samples can be transferred into the main chamber for the XPS analysis without exposure to air after treatments in the catalysis cell. This catalysis cell can also be operated as a batch reactor. The gas phase components can be monitored by feeding a trace amount of gas into a mass spectrometer which is installed on the system. The sample stage has the heating and cooling capabilities as well, which allow in situ high or low temperature XPS analysis to be carried out with samples held at a temperature from 600 C to a temperature below – 150 C depending on the cooling medium used. A charge neutralizer is installed on the system to neutralize the surface charge so that nonconductive materials, such as catalysts supported on oxides, can be analyzed by XPS. An ion sputtering gun is aligned with the XPS analysis area, which provides the ability of the depth profiling samples as well. The system is operated by a professional person having a very solid background in XPS and other surface science techniques. The system is open to outside users and we are also seeking collaborations with industrial and academic researchers.