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Semiconductor Surface and Interface Characterization by Photoelectron Spectroscopy Part I

Photoelectron Spectroscopy (PES) is a very surface sensitive method to detect occupied electronic states in a Material. Because of its surface sensitivity it is placed in an Ultra High Vacuum (UHV) environment with a basic pressure $< 10^{-8}$ mbar. Depending on the excitation radiation different surface sensitivities and material information can be archived. The excitation radiations are Synchrotron (SXPS), X-ray (XPS) and Ultra Violet (UPS) radiation. Because of the similarity to PES also Auger Electron Spectroscopy (AES) is covered.

In this talk the basic principles of PES and AES are explained and examples are given how to use these methods to characterize semiconductor materials and their interfaces. The characterization options are: elemental analysis, compositional analysis, layer thickness determination, partial density of states detection, determination of chemical bonding, detection of surface potential changes and interface analysis. A brief explanation of the basic experimental setup is given based on the XPS setup of the surface science group.