

Basic Aspects of X-ray Photoelectron Spectroscopy

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X-ray photoelectron spectroscopy (XPS), often referred as ESCA (Electron Spectroscopy for Chemical Analysis) stands as a surface-sensitive, quantitative spectroscopic technique that is widely used for the study of the electronic structure of materials. These capabilities make XPS an exceptional and indispensable tool for the materials characterisation and for understanding many aspects of surface chemistry, thus unveiling crucial insights into material composition and surface interactions. In this lecture, I intend to explore the essential aspects of this technique and to give the fundamental theory necessary for interpreting data stemming from XPS experiments. Given the breadth of content, I will present an outline of various theoretical concepts that are important to describe the photoemission process, discussing basic assumptions and key ideas, and showcasing meaningful examples. The purpose of this lecture is to offer a foundational background about this technique, which will help to understand in depth the implications and outcomes of simple and more specialized experiments.