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Effective Data Analysis in X-ray Photoelectron Spectroscopy: A Tutorial

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X-ray photoelectron spectroscopy (XPS) holds a significant position among photoelectron spectroscopies, being particularly well-suited for investigating a broad range of materials. It provides precise and quantitative information about the elemental composition with specific surface sensitivity. While the ability to determine the chemical composition of surfaces and interfaces is a key feature of this technique, interpreting the results can sometimes be challenging and complex, potentially leading to incorrect conclusions.

In this tutorial lecture, I will review essential methodologies for effective and meaningful data analysis in core-level photoelectron spectroscopy experiments. After outlining the basics of the photoemission process, I will present strategies to extract information from core-level spectra, with a specific focus on synchrotron-based experiments. I will cover different types of backgrounds, core-level lineshapes, and satellite structures. Relevant case studies and examples will be discussed to illustrate these concepts, along with strategies useful for interpreting data in synchrotron-based core-level photoelectron spectroscopy.