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# Overview of photoemission spectroscopy as a tool for electronic structure investigations of materials

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Investigating the electronic structure of solid materials is a very powerful tool to get insights into the oxidation state, composition, chemical bonding, binding energies and correlation effects, as well as the low-energy electronic band structure and the Fermi surface of these materials. Such investigations are carried out experimentally by exploiting a technique named photoemission spectroscopy, which gives access to the either the deep core levels, in case of X-ray photoemission spectroscopy, or the low-energy valence band states, in case of UV photoemission spectroscopy and angle resolved photoemission spectroscopy.
In this lecture, I will first talk about the basic theoretical principles of this experimental technique, namely the three-step model of photoemission in solids, the single-particle energy diagram, conservation of energy and momentum and matrix elements. I will then move on to discussing the features of photoemission spectra that carry the relevant information on the properties of solids, such as spin-orbit splitting, chemical shift, peak line shape and satellites. I will then conclude my presentation by presenting a summary of recent interesting results, which show that electronic structure investigations find diversified applications in condensed matter physics, surface science, nanotechnology, semiconductor devices, materials engineering, chemistry, catalysis, water purification and geology.

## Apply to be<br> considered for a student <br>   award (Yes / No)?

No

## Level for award<br> (Hons, MSc, <br>   PhD, N/A)?

N/A

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