

Local Spectroscopies for the Nanosciences

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The course will give an account on the theoretical and experimental aspects of local probes providing unique access to electronic properties at the nanoscale. Whenever required, notions of thermodynamics, electronic theory and crystallography of surfaces will be introduced from scratch. In this lecture series, we will emphasize that marked deviations from the solid state, the so-called quantum size effects, manifest themselves in most properties of nano-objects. As a result, new experimental and theoretical approaches will be introduced. Making use of the spectroscopic ability of local probes, we will describe how to access magnetic, optical, catalytical and superconducting properties of molecules, clusters and nanoparticles on surfaces. Special attention will be devoted to the interaction of these objects with their environment. More classical methods, will sometimes be introduced as the basic premises to the presentation of local probe techniques.

Main topics:

- Theoretical background of scanning tunneling microscopy & spectroscopy
- Physics at surfaces, ultrahigh vacuum and low temperatures
- Atomic manipulation,
- Quantum confinement & size-effects,
- Charge density waves and superconductivity,
- Molecular electronics,
- Spin-polarized probes & applications,
- Atomic force microscopy,
- Magnetic force detection,
- Hysteresis and magnetic domains at the nanoscale,
- Near field optical microscopy & plasmonics,
- Chemisorption and catalysts.

Time: 4, 11, 18, 25 March and 8, 15, 22, 29 April 2021 from 14:00 to 16:00

Place: Auditorium IPCMS, 23 rue du Loess, Strasbourg **Online**