



SEMINARIO

Infrared spectromicroscopy and imaging with six decades of dynamic range

FERENC BORONDICS

SMIS Beamline Responsible, Soleil Synchrotron
Gif sur Yvette Cedex, France

MARTES 29 DE ENERO A LAS 12:00

Departamento de Física de Materiales, Sala de Seminarios, UCM

Infrared spectroscopy has been in the toolbox of scientists from a variety of fields for many decades to obtain information about vibrational properties and low energy electrostatics. The beginning of the 1980s brought the first commercial far-field infrared microscopes and the possibility to look into the details. Infrared spectromicroscopy had been pushed to its limits starting in the 1990s in synchrotron facilities by exploiting the unmatched quality of synchrotron radiation, i.e. low angular divergence and extremely broad bandwidth. Synchrotron infrared spectromicroscopy beamlines provide diffraction limited spatial resolution covering the whole IR range and allowing measurements not possible otherwise. Using two-dimensional detectors in far-field instruments allowed measurements of very large area samples with high spatial resolution. The turn of the century brought the advent of near-field IR techniques and thus the breaking of the diffraction limit. Combining high brightness IR sources with atomic force microscopes to detect either photothermal expansion or near-field scattering allowed measurements hundreds of times below the diffraction limit reaching as high as ten-nanometer spatial resolution. Most recently, optically sampled photothermal spectromicroscopy has become available to bridge the resolution gap between the nanometer and micrometer range and provide sub-diffraction limited information relevant to various kinds of samples.

The instrumentation at the SMIS beamline in SOLEIL covers six orders of magnitude spatial dynamic range, therefore providing an unprecedented facility that employs all of the above-mentioned techniques combined with custom instrumentation to support scientific discoveries. In my talk, I will review the capabilities of SMIS through experiments done by SMIS staff and users highlighting a variety of fields and also comment on the benefits of emerging, alternative sources.