Synchrotron infrared nanospectroscopy: concept and recent developments at LNLS

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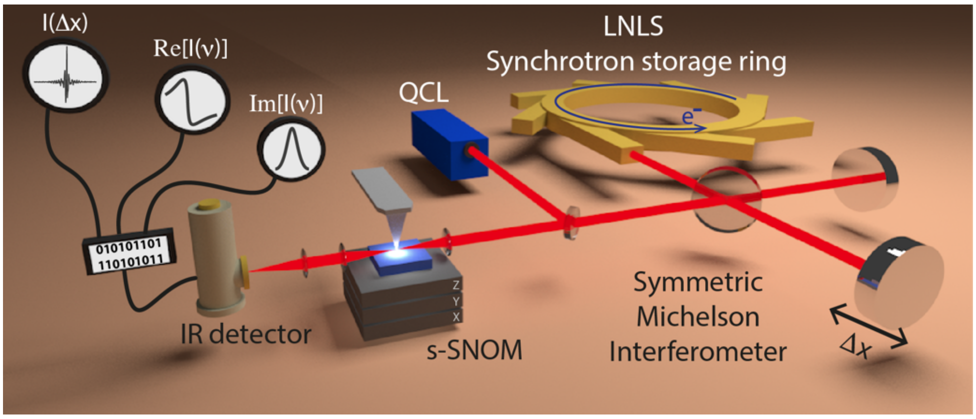
Infrared scattering-type scanning near-field optical microscopy (s-SNOM) has become a prominent technique in imaging science due to its potential to provide nanoscale spatially resolved chemical spectroscopy for the investigation of molecular, soft-matter, and biological materials. With the use of synchrotron IR sources, which deliveries high spectral irradiance through the whole mid-IR range, IR s-SNOM is a powerful technique able to access broadband vibrational response of materials in the nanoscale. In that scenario, physical-chemical investigations which are not spatially resolved by IR micro-spectroscopy (μ-FTIR) have now the opportunity to be accessed by a probe no larger than few tens of nanometers.

In the last 3 years important works [1-3] have confirmed the versatility of synchrotron IR s-SNOM on the study of a variety of materials. However, some challenges are still to be overcome by the technique, specially related to the analysis of organic materials which are weak scatterers and consequently demand improved sensitivity. Moreover, steps such as normalization, environment control, beam stability and data processing are still in constant development.

In this talk I will discuss fundamental aspects of the s-SNOM technique, construction details of the IR nanospectroscopy endstation of LNLS, sample requirements and few recent results in the fields of 2D materials, bio-polymer films and biological tissues. In the side of experimental developments of the technique, I will discuss alternative detection schemes for s-SNOM [4] and the impact of the beamline stability in normalization procedures for synchrotron IR s-SNOM.



References

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