

Synchrotron Radiation Opportunities at Elettra: a focus on infrared synchrotron radiation for Life Sciences

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The present seminar aims to introduce to the audience Elettra Sincrotrone Trieste [1]. Elettra is a multidisciplinary international research center of excellence, specialized in generating high quality synchrotron and free-electron laser light and applying it in materials and life sciences. The potentialities of the third generation storage ring and the opportunities for collaborative research will be highlighted, with emphasis on the upgrades plan of the facility.

The second part of the seminar will be focused on the exploitation of infrared synchrotron radiation (IRSR) at the beamline SISSI (Synchrotron Infrared Source for Spectroscopy and Imaging [2]), focusing on the Chemical and Life Sciences branch, SISSI-Bio. The no-damaging nature of IRSR is a unique feature in SR facilities, which allows the safe investigation of vibrational transitions for a wide variety of materials. SISSI-Bio is optimized for FTIR spectroscopy and microscopy analyses in the medium infrared energy range, and it is particularly devoted to the study of biochemical and biophysical processes, also in complex systems such as animal tissues and live cells. Selected examples on topics spanning from protein conformational analysis to molecular biology will be presented, focusing on the achievements as well as on the technical challenges.

Indeed, the spatial resolution associated to IR analyses has been limited up to recent years to the micrometre scale, ultimately imposed by diffraction. Infrared scanning-type scattering near field optical microscopy (IR s-SNOM) has permitted to circumvent the diffraction barrier and to improve the spatial resolution of IR microscopy down to the nanometer scale. The very recent SISSI-Nano branch will be presented, along with selected examples highlighting the potentiality of multiscale FTIR analysis, from macro to nanoscale, in the fields of biology and cultural heritage.

[1] The Synchrotron Light Source Elettra <https://www.elettra.trieste.it/>

[2] SISSI - Synchrotron Infrared Source for Spectroscopy and Imaging <https://www.elettra.trieste.it/lightsources/elettra/elettra-beamlines/sissi/sissi.html>