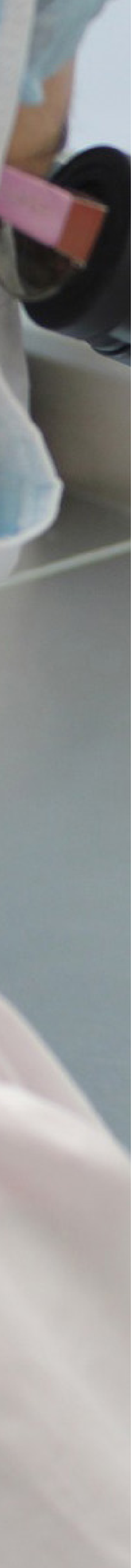
ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

NANOSTRUCTURE ANALYSIS

A knowledge driven design of nanomaterials requires a profound understanding of the underlying atomic and electronic structures. The University of Bologna employs state of the art scanning microscopies and spectroscopic techniques to reveal such details at the atomic to nanometer level and provide researchers unprecedented insight into the structure of their materials.



The research of the University of Bologna selects the most efficient analysis technique for a given nanomaterial sample:

- Atomic force microscopy to investigate nanostructures on surfaces. Different techniques to assess functional properties of nanostructures based on mechanical, electrostatic, conductive, piezoelectric or electrochemical probes
- Scanning electron microscopy to reveal the structure of fibrous or porous samples
- Light scattering to determine the size of dispersed nanoparticles
- X-ray scattering techniques to determine particle size distributions and crystallinity in nanostructured samples
- Time resolved spectroscopic techniques to investigate optical properties and energy transfer in nanostructured materials
- Nanoindentation experiments to assess mechanical properties at the nanoscale
- Determination of the local chemical composition of nanostructures by FTIR and EDS-SEM
- Confocal optical microscopy to reveal 3D structures and optical properties in nanostructured samples
- Scanning electrochemical microscopy (SECM) to investigate the functionality and the reactivity of the nano-objects

The University of Bologna has a strong experience in several advanced techniques:
Scanning Electrochemical microscopy: ultramicro-/nanoelectrode probes to image the functionality and reactivity of nano-objects. Among other applications, this technique allow to assess charge transfer phenomena at single entity level; local conductivity; electro-catalytical/catalytical efficiency of the nanostructures; local reactions; the effect of the interaction of nanoobjects with living cells.

Functional nanoelectronic characterizations: scanning probe microscopies with electrostatic interactions, to achieve multimodal acquisition of structural and electronic properties at the nanoscale (i.e. allowing the investigation of failure mechanisms in flexible nanoelectronic devices).

Synchrotron Radiation and Free Electron Lasers for Fine Analysis: X-ray spectroscopy and scattering methods for fine characterization of the atomic and electronic structure of advanced materials and nanostructures. Studies of fundamental interaction mechanisms and methods on the ultra fast (femtosecond) time scale.