

Synchrotron Vibrational Spectroscopy and Nuclear Magnetic Resonance (NMR) Techniques for Industrial Applications

CERIC-ERIC Headquarters in Trieste (Italy)

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Description

CERIC-ERIC will host the first small scale Research to Business (R2B) meeting organized in the framework of the H2020 ACCELERATE project. The event will take place in the Italian CERIC Partner Facility at Elettra Sincrotrone Trieste. Expert researchers will present the Synchrotron, as well as Nuclear Magnetic Resonance (NMR) techniques, to an industrial public, to encourage ideas for possible future synergies and collaborations.

The workshop will focus on Synchrotron Vibrational Spectroscopy Techniques for Industrial Applications: Infra-Red (IR), Nano IR, Raman and Micro Raman with Synchrotron Radiation. In addition, NMR, the complementary method available via CERIC at the Slovenian CERIC Partner Facility at the National Institute of Chemistry in Ljubljana, will be introduced.

By using these and other complementary techniques, it is possible to perform quantitative and qualitative chemical and biochemical characterisation of organic and inorganic molecules with a micrometric and nanometric resolution, and study mass transport processes, morphology and electronic properties of complex materials.

SISSI, the Infrared (IR) beamline at Elettra, extracts IR and visible components of synchrotron emission for performing FTIR, spectroscopy, microspectroscopy and imaging. Synchrotron radiation techniques, compared with bench-top techniques allow higher resolution, improved signal to noise ratio and faster analyses. These advantages can be exploited for research in several field of science and industrial applications including surface and material science, biochemistry, forensics, microanalysis, geology, cell biology, biomedical diagnostics, high-pressures, conservation science, protein folding, chemical kinetics etc. In particular:

- in the textile sector, for the study of polymers, polyamides and other materials for high quality application, as well as to solve issues related to their technical characteristics
- in the cellular microbiology sector for the investigation of biofilms, cellular response to stressors, bacterial strain identification
- in the pharmaceutical sector for the assessment of the cellular response to new developed drugs, conformational analysis of target proteins, investigation of efficient formulation and storage conditions

The Raman technique is a useful to study the chemical and structural conformation of a given sample, in particular the interaction of molecules with different environments. The strength of Elettra technique is the high versatility of the set-up, thus allowing to carry out customized measurements according to user needs, differently to what occurs with the standard Raman set-up available elsewhere.

It allows to obtain very specific information about the system of interest. The applications can be several and diversified, such as:

- Through micro Raman compound mapping under to micron resolution, for example, in environmental studies such as in plastic pollution, or in the study of graphene, nanotubes and other graphene systems.
- Selective studies of peptides and proteins, as well as hydrogels and macromolecules characterization.
- Study of pharmaceutical compounds and their interaction with DNA.

Particular interesting is the possibility to carry out UV Resonant Raman measurements. The advantage is a better and more specific characterization of many organic compounds.

In addition to that, the performance of liquid and solid state NMR in industrial applications will be also presented. The determination of Active Pharmaceutical Ingredient (API) and of the interactions between API and excipients in pharmaceutical formulations is one of the results delivered by this technique, for protein determination in the field of biosimilars. Structural characterization of small organic molecules in the solution, the kinetics of conversion and the dynamics of molecules, as well as the determination of samples' purity, is a must for the Slovenian CERIC facility.

The meeting will be open for interested participants, i.e. R&D managers, business developers and researchers from industry and other research entities, in order to share case studies, strengths and needs related to industrial applications, innovation and knowledge transfer opportunities during the network and discussion.