Elettra Sincrotrone Trieste

Proposal for Master Degree thesis in Physics:

Studies on solvation of biomolecules by UV Resonance Raman spectroscopy with synchrotron light

Description: Solvation of biomolecules in non-conventional media such as Ionic liquids (ILs) and deep eutectic solvents (DESs) offers a promising alternative to organic solvents both for stabilizing and preserving the structure of biomolecules (peptides, proteins and DNA). A detailed understanding of the micro-solvation environment at the molecular level is needed to be studied both experimentally and theoretically in order to have valuable information on the activation/deactivation and stability of biomolecules in different non-aqueous media.
Raman spectroscopy is a non-destructive vibrational technique very useful to provide molecular information on several kind of systems, such as liquids, gels, polymers and bio-macromolecules through the investigation of their vibrational dynamics. Thanks to the resonance effect, UV Resonance Raman (UVRR) spectroscopy offers several advantages with respect to spontaneous Raman one, such as the significant increment of the detection limit and the selectivity needed to incisively monitor specific chromospheres within the sample. This determines the usefulness of multi-wavelengths UVRR spectroscopy to probe biomolecular interactions and solvation effects in complex systems such as bio-macromolecules in aqueous and non- aqueous media.
The beamline IUVS at Elettra Sincrotrone Trieste (www.elettra.eu) is the laboratory unique in the world where a UVRR setup exploiting the wide and fine tunability of the synchrotron radiation source is available. This synchrotron-based UVRR setup is an innovative deep-UV spectroscopy facility enabling to "map" the whole resonance landscape of the samples for matching with the best experimental conditions.
The thesis project will be carried out in part at Elettra Sincrotrone Trieste, that is a multidisciplinary research center of excellence, open to the international research community, specialized in generating high quality synchrotron and free-electron laser light and applying it in materials and life sciences. Scientists from all over the world can access the 28 beamlines operating at Elettra by submitting proposals that are evaluated on the basis of pure scientific merit and potential impact. The student will have the opportunity to acquire the necessary skills for the use of the synchrotron-based UVRR setup and to personally contribute to the implementation of the measurements and data analysis.

More info:
https://www.elettra.trieste.it/lightsources/elettra/elettra-beamlines/iuvs/research.html

References:
Rossi, B. et al. *Phys. Chem. Chem. Phys.* **2021**, *23*, 15980. DOI: 10.1039/d1cp01970h.
Fadaei, F. et al. *J. Mol. Liq.* **2022**, *347*, 118350.1. DOI: 10.1016/j.molliq.2021.118350.

Start of activity:
December 2022, or later

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