universität freiburg

At the Institute of Physics, University of Freiburg, we are offering

PhD position (m/f/d)

On the **development of cluster isolation techniques for the study of fragile chiral organic molecules with time-resolved photoelectron circular dichroism**

Different enantiomers of chiral molecules have indentical physical properties while often causing widely different responses in biological systems. This makes analytical techniques with a high sensitivity to chirality important for the different industries. Among the chiroptical methods, the so-called photoelectron circular dichroism (PECD) takes a special place, as it is fully included in the electric dipole approximation of light matter interaction. PECD causes an asymmetry in the photoelectron angular distribution of chiral molecules ionized with circularly polarized light, that changes its sign when either the handedness of the light polarization or the handedness of the molecule is inverted.

A key challenge in PECD studies is the creation of dense and cold molecular targets. Ideally, the molecular temperatures should be low enough to allow only single molecular conformers to be populated. While this is routinely achieved for rigid high-vapor pressure model systems, this can be extremely challenging for fragile biomolecules and pharmacologically active substances. In this project we aim to cobine Laser-based thermo-acoustic desorption techniques with helium nanodroplet isolation techniques to produce extremely cold isolated samples of chiral biomolecular building blocks, for their study with circularly polarized XUV radiation at ELI beamlines.

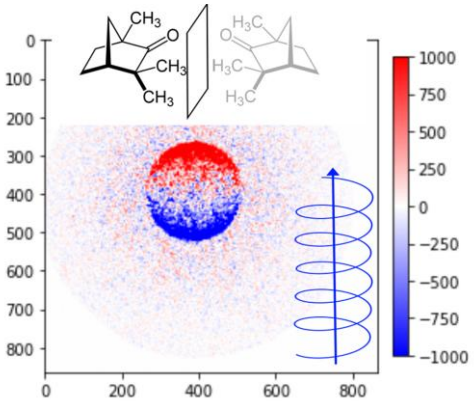

Figure 1: Asymmetry in Photoelectron angular distribution (PECD) of the (+)-Fenchone, a typical rigid chiral model compound

Relevant publications:

1. Hartweg, S., et al., J. Phys. Chem. Lett. 2021. **12**(9),
2. Michelbach, M., et al., Low Temperature Physics, 2025. **51**(4)
3. Hartweg, S., et al., arXiv preprint arXiv:2510.05945, 2025

We are looking for a highly motivated PhD student to join our team. Candidates should have strong interest in molecular physics, physical chemistry and building experimental setups. Experience in the use of vacuum equipment, molecular or cluster beam techniques as well as basic programming skills are advantageous. Good communication skills are needed.

Your task will be to combine Laser-based thermo-acoustic desorption methods with continuous and pulsed helium nanodroplet sources to produce isolated molecular samples of chiral molecules for time-resolved PECD studies at ELI beamlines.

Applications should be sent as a **single pdf-file** including a letter of motivation, CV, certificates of university degrees (with grades) and the contact details of at least two references. Please indicate the subject “PhD PECDELI” in your email. Applications should be submitted until **December 31, 2025.** The position remains open until a suitable candidate is found.

Contact:

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The University of Freiburg seeks to increase the number of female scientific faculty members and therefore strongly encourages qualified women to apply. The university is committed to provide a family-friendly workplace. In case of equal qualification, persons with disabilities will be given preference.