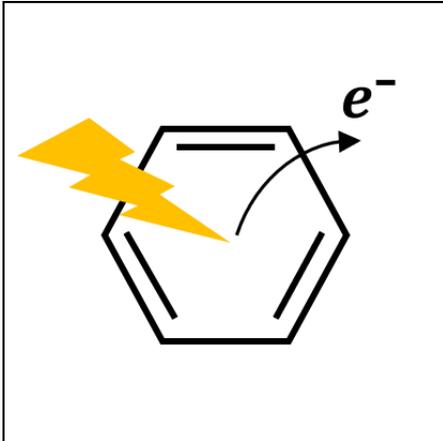


PhD position:

Developing experiments to study ultrafast molecular photochemistry



Photochemical processes play a crucial role in nature. Yet, understanding the underlying molecular dynamics remains a challenge. The main difficulties comprise of the ultrafast timescales of the dynamics paired with a complex interplay of many molecular degrees of freedom. We will develop a unique experimental method to address these issues: To reduce the complexity of the system, single molecules and small molecular units will be isolated in vacuum. The samples will be studied with a new spectroscopic concept combining ultrafast XUV photoelectron spectroscopy with interferometric and multidimensional methods (for preliminary work see [1–4]). This will unlock many exciting possibilities to explore fundamental molecular processes on the quantum level. Examples

are molecular isomerization, tautomerization, intra and inter-molecular energy and charge transfer. These molecular mechanisms are at the core of many processes in nature, for instance the photo-damage in DNA, the (un-)folding of proteins, photocatalysis, photovoltaics and photosynthesis.

[1] L. Bruder et al., J. Phys. B: At. Mol. Opt. Phys. **52**, 183501 (2019)

[2] A. Wituschek et al., Nat Commun **11**, 883 (2020)

[3] D. Uhl et al., Optica **8**, 1316 (2021).

[4] U. Bangert et al., Nat Commun **13**, 3350 (2022).

The PhD candidate will join a friendly team of highly motivated researchers at the University of Freiburg to work on this timely research project. The main focus of the PhD project lies on building and developing the new experimental method and perform experiments with the new setup. Depending on the candidate's preferences and abilities, the PhD project will focus on either of the following aspects: laser engineering and nonlinear optics; the development of the XUV beamline; molecular and cluster beam techniques for sample preparation in combination with photoelectron/ion detection.

The PhD project will be embedded in the graduate school <https://rtg-dyncam.de/> which provides an outstanding environment for the research and career development of the doctoral candidate, including the possibilities for extended research stays at our international collaborators during the PhD project.

Candidates should have strong interest in atomic and molecular physics or physical chemistry. Experience in the use of ultrafast lasers and/or vacuum equipment as well as basic programming skills (python/matlab) is desired. Good communication skills are needed. **The candidate should bring great interest in building experimental setups.** Applications including a letter of motivation, a CV, certificates of your university degree (including grades), a transcript of records and contact details of two references should be sent in a **single** pdf file to the email contact in the box. Please indicate the subject "PhD MULTIPLEX" in your email. The position remains open until a suitable candidate is found.

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