

MO 10: Poster – Chirality

Time: Tuesday 14:00–16:00

Location: Tent

MO 10.1 Tue 14:00 Tent

Investigation of chiral structural dynamics using time-resolved PECD — •NICOLAS LADDA, FABIAN WESTMEIER, TONIO ROSEN, SUDHEENDRAN VASUDEVAN, SIMON RANECKY, SAGNIK DAS, TILL JAKOB STEHLING, KRISHNA KANT SINGH, HENDRIKE BRAUN, JOCHEN MIKOSCH, THOMAS BAUMER, and ARNE SENFTLEBEN — Institute of Physics and CINSaT, University of Kassel, Heinrich-Plett-Strasse 40, 34132 Kassel, Germany

The dynamic change of the chiral character during laser-induced vibrational motion in an electronically excited state of methyl p-tolyl sulfoxide (MTSO) is investigated [1]. For this purpose, we measure the forward/backward asymmetry of the photoelectron angular distribution (PAD) with respect to the propagation direction of ionising circularly polarised light of the randomly oriented chiral molecule, known as photoelectron circular dichroism (PECD) [2]. The vibrational motion in the electronically excited state changes the chiral character of the molecule, which can be investigated by studying the time-resolved PECD with UV femtosecond laser pulses. For this purpose, a two-colour pump-probe setup consisting of 262 nm and 197 nm is used. The current state of the experiment will be reported.

[1] W. Sun, I. Kleiner, A. Senftleben, M. Schnell, *J. Chem. Phys.* 2022, 156, 15, 154304.

[2] N. Böwering, T. Lischke, B. Schmidtke, N. Müller, T. Khalil, U. Heinzmann, *Phys. Rev. Lett.* 2001, 86, 1187

MO 10.2 Tue 14:00 Tent

Towards the measurement of Photoelectron Circular Dichroism of (M)-[4] triangulane — •TONIO ROSEN, NICOLAS LADDA, SIMON RANECKY, SAGNIK DAS, SUDHEENDRAN VASUDEVAN, TILL STEHLING, FABIAN WESTMEIER, JOCHEN MIKOSCH, KRISHNA SINGH, HENDRIKE BRAUN, ARNE SENFTLEBEN, and THOMAS BAUMERT — Universität Kassel

[n] Triangulanes are helically chiral molecules with structural helicity, providing a chiral scattering potential for electrons upon photoionization and a helical electron distribution in its highest occupied molecular orbital [1]. Hence, these molecules are promising for investigating photoelectron circular dichroism (PECD) after resonance-enhanced multiphoton ionization in the gas phase. PECD is defined as a forward-backward asymmetry in photoelectron distribution with respect to the laser propagation direction in chiral molecules ionized with circularly polarized light [2]. Using a velocity map imaging spectrometer, we aim to investigate the PECD of the smallest chiral triangulane, the [4] triangulane, in the 200- to 800 nm range. To this end, we want to employ gas chromatography, separating the enantiomers of a racemic mixture before their introduction into the experimental chamber. In this contribution, we will present the recent progress of this project. [1] A. de Meijere et Al., The First Enantiomerically Pure [n]Triangulanes and Analogues: σ -[n]Helicenes with Remarkable Features. *Chem. Eur. J.* 8. [2] C. Lux et Al., Circular dichroism in the photoelectron angular

distributions of camphor and fenchone from multiphoton ionization with femtosecond laser pulses. *Angew. Chem. Int. Ed.* 51.

MO 10.3 Tue 14:00 Tent

Coherent control of circular dichroism in ion yield of chiral molecules — •SAGNIK DAS, SUDHEENDRAN VASUDEVAN, NICOLAS LADDA, SIMON RANECKY, TONIO ROSEN, TILL JAKOB STEHLING, FABIAN WESTMEIER, KRISHNA KANT SINGH, ARNE SENFTLEBEN, JOCHEN MIKOSCH, THOMAS BAUMERT, and HENDRIKE BRAUN — Institut für Physik, Universität Kassel, Heinrich-Plett-Strasse 40, 34132 Kassel, Germany

The use of shaped femtosecond laser pulses is a proven strategy for directing reaction and excitation pathways in molecular systems [1,2]. We have employed shaped femtosecond UV pulses to control the Circular Dichroism in Ion Yield (CDIY) of 3-methylcyclopentanone [3]. Our findings suggest that pulse duration, linear chirp, and central wavelength of the excitation can control the CDIY. Additionally, the conformer dynamics of the molecule in the excited state may contribute to enhanced CDIY. Currently, we are investigating the control of CDIY in substituted fenchone with pulse parameters similar to those above at visible wavelengths. We aim to extend our control over CDIY by exploiting more flexible and customized pulse shapes through advanced pulse shaping techniques.

[1] A. Assion et al., *Science* 282, 919-922 (1998)

[2] M. Wollenhaupt & T. Baumert, *Faraday Discuss.* 153, 9-26 (2011)

[3] S. Das et al., manuscript to be submitted (2024)

MO 10.4 Tue 14:00 Tent

Towards probing Rydberg wave packet dynamics in chiral molecules via time dependant photoelectron circular dichroism — •SAGNIK DAS, TONIO ROSEN, NICOLAS LADDA, SUDHEENDRAN VASUDEVAN, SIMON RANECKY, TILL STEHLING, FABIAN WESTMEIER, JOCHEN MIKOSCH, KRISHNA SINGH, HENDRIKE BRAUN, ARNE SENFTLEBEN, and THOMAS BAUMERT — Universität Kassel

A Rydberg wave packet is a superposition of multiple, highly excited electronic states (Rydberg states). The evolution of these wave packets exhibits radially oscillating charge density with fixed revival times [1]. These radial charge density oscillations could prove chiral sensitive in a chiral molecular potential. This Project aims to probe the Rydberg wave packet dynamics in the chiral molecules fenchone and thiofenchone using time-dependent photoelectron circular dichroism (PECD). PECD is defined as the forward-backward asymmetry in photoelectron distribution with respect to the laser propagation direction in chiral molecules ionized with circularly polarized light [2]. In this contribution, we will provide preliminary data and report on the project's current status. [1] Fielding, H. H., *Ann. Rev. Phys. Chem.*, 56, 91-117 (2005) [2] Lux, C. et al., *Angew. Chem. Int. Ed.* 51, 5001*5005 (2012)