

# Photoelectron Circular Dichroism of Bicyclic Ketones from Multiphoton Ionization with Femtosecond Laser Pulses

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The front cover artwork is provided by Prof. Thomas Baumert and co-workers (Institut für Physik und CINSaT Universität Kassel) and Prof. Matthias Wollenhaupt (Carl von Ossietzky Universität Oldenburg). The image shows circular dichroism in the 10% regime from randomly oriented (*S*)-(–)-camphor molecules in the gas phase observed on the 3D momentum distribution of ejected photoelectrons after three-photon ionization with a table-top laser set-up.

Read the full text of the article at 10.1002/cphc.201402643.

## What are the most significant results of this study?

We present photoelectron circular dichroism (PECD) by femtosecond multiphoton ionization with a table-top laser source. This is an extension of single-photon PECD obtained so far by the use of synchrotron light sources and has been introduced by our group recently. Multiphoton PECD supplies a wealth of additional information, and therefore, is a very promising new technique for research and analytics of chiral molecular systems. Here, we give a full account of our experimental methodology for measuring the multiphoton PECD and derive quantitative measures that we apply on camphor, fenchone and norcamphor.

## What other topics are you working on at the moment?

With respect to research on the interaction of chiral light with chiral molecular systems, we are currently investigating changes in the PECD when changing the total amount of angular momentum absorbed by the molecules. Specifically, we investigate the PECD on the above-threshold ionization (ATI) part of the signal.

With respect to analytics of chiral molecular systems, we study the sensitivity of the PECD to enantiomeric excess. Currently we can distinguish differences in enantiomeric excess in the 1% regime.

## What future opportunities do you see (in the light of the results presented in this paper)?

Exploiting coherence properties of light together with quantum-mechanical matter interferences to steer a quantum system to a desired target or dynamical behaviour is the essence of coherent control. Femtosecond laser pulses shaped in phase, amplitude and polarization are a natural tool to that end. An exploration of the nuclear and electron dynamics of the intermediate resonance based on coherent-control techniques might help to increase the analytical sensitivity even

further and together with theory open an additional route to determine the absolute configuration. In addition, the development of laser-driven purification schemes might be simplified when combining the high sensitivity of PECD to enantiomeric excess with coherent-control techniques.

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