MO 19: Poster – Contributions to SYLC

Time: Wednesday 17:00–19:00 Location: Philo 1. OG

MO 19.1 Wed 17:00 Philo 1. OG

Femtosecond transient circular dichroism spectroscopy and transient circularly polarized luminescence of chiral copolymer thin films — •Kawon Oum and Thomas Lenzer — University of Siegen, Physical Chemistry 2, Adolf-Reichwein-Str. 2, 57076 Siegen

We have recently developed an experimental methodology enabling the simultaneous recording of transient absorption (TA) and transient circular dichroism (TrCD) responses of photoexcited systems across the ultraviolet-visible spectral range (260-700 nm) with a time resolution of ca. 100 fs. This approach has been applied to chiral polyfluorene copolymer thin films exhibiting intrinsic [1] and induced supramolecular chirality,[2,3] where exceptionally strong circular dichroism signals of up to 16000 mdeg and dissymmetry factors approaching 0.7 were observed. Complementary steady-state and transient circularly polarized luminescence (TrCPL) studies reveal a remarkable sign inversion of both CD and CPL signals with increasing film thickness and annealing temperature, attributed to structural reorganization within the chiral supramolecular phase.[4] The pronounced chiroptical activity of these films highlights their potential for optoelectronic applications, particularly in OLEDs with intrinsic circularly polarized emission.

[1] M. Morgenroth et al., Nat. Commun. 2022, 13, 210. [2] M. Morgenroth et al., Angew. Chem. Int. Ed. 2022, 61, e202203075. [3] D. Gust et al., Sci. Rep. 2024, 14, 12694. [4] D. Gust et al., ChemPhotoChem 2025, e202500196.

MO 19.2 Wed 17:00 Philo 1. OG

Ultrafast TACOS — •Justas Terentjevas[1,2], Patricia Vindel-Zandbergen[3], Laura Rego[2,4,5], Felipe Morales[1], Andrés Ordóñez[2], Olga Smirnova[1,6], and David Ayuso[1,2] — [1]Max-Born-Institut, 12489 Berlin, Germany — [2]Department of Physics, Imperial College London, SW7 2BW London, UK — [3]Department of Chemistry, New York University, New York 10003, New York, USA — [4]Instituto Madrileno de Estudios Avanzados en Nanociencia (IMDEA Nano), Cantoblanco 28049, Madrid, Spain — [5]Departamento de Quimica, Universidad Autonoma de Madrid, 28049 Madrid, Spain — [6]Technische Universitat Berlin, 10623 Berlin, Germany

We introduce TACOS - Terahertz-Assisted Chiro-Optical Spectroscopy - a novel approach for ultrafast chiral recognition. We show that a terahertz field can electronically orient a medium of randomly oriented chiral molecules to twist the nonlinear response to an ultrashort optical pulse in a highly enantiosensitive manner. This process leads to the emission of elliptically polarised light at new optical frequencies that records the molecular handedness via purely electric-dipole interactions. The long wavelength and period of the terahertz pulse enable spatial coherence across the interaction region and a substantial degree of electronic orientation during the interaction of the molecules with the ultrashort optical pulse. TACOS does not require optical carrier-envelope phase stability or vacuum conditions, thus opening new avenues for ultrafast and highly efficient chiral sensing and manipulation.

MO 19.3 Wed 17:00 Philo 1. OG

Detection and control of molecular chirality in molecular ensembles — •Alexander Blech[1], Loren Greenman[2], Reinhard Dörner[3], and Christiane P. Koch[1] — [1]Fachbereich Physik, Freie Universität Berlin, Berlin, Germany — [2]Department of Physics, Kansas State University, Manhattan, KS, USA — [3]Institut für Kernphysik, Goethe-Universität, Frankfurt am Main, Germany

Photoelectron circular dichroism (PECD) - the forward-backward asymmetry in the photoelectron angular distributions of chiral molecules upon ionization with circularly polarized light - can detect molecular chirality in randomly oriented molecules with high sensitivity. With orientation, also achiral molecules yield PECD. This raises the question whether and if so, under which conditions, PECD signals unequivocally molecular chirality. We address this question through symmetry analysis and show that, when combined with rotational excitation using three mutually orthogonal polarization directions, PECD can reveal chirality even in racemic mixtures. Whereas such sequences of static and non-resonant fields yield PECD also for certain achiral molecules, microwave three-wave-mixing cycles can, in principle, unambiguously detect chirality in arbitrary molecular ensembles. Finally, we demonstrate that fields with three orthogonal polarization directions can not only detect but also induce chirality via chiral rotational dynamics, offering a new pathway for laser-based control of molecular handedness.