

WHAT CAN WE LEARN ON GAS PHASE CHIRAL COMPOUNDS BY PHOTOELECTRON CIRCULAR DICHROISM ?

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Since 15 years, a new type of chiroptical effect has been the subject of a large array of both theoretical and experimental studies: Photoelectron Circular Dichroism (PECD) in the angular distribution of photoelectrons produced by CPL-ionization of pure enantiomers in the gas phase observed as a very intense (up to 35 %) forward/backward asymmetry with respect to the photon axis and which reveals the chirality of the molecule (configuration).

PECD happens to be an orbital-specific, photon energy dependent effect and is a very subtle probe of the molecular potential being very sensitive to static molecular structures such as conformers, chemical substitution, clusters, as well as to vibrational motion, much more so than other observables in photoionization such as the cross section or the β asymmetry parameter (for a recent review see L. Nahon, G. A. Garcia, and I. Powis, *J. Elec. Spec. Rel. Phen.* 204, 322 (2015)). Therefore PECD studies have both a fundamental interest as well and analytical interest, especially since chiral species are ubiquitous in the biosphere, food and medical industry. This last aspect is probably the driving force for the recent extension of PECD studies by the laser community using UV REMPI schemes.

After a large introduction to the PECD process itself, and a description of our double imaging electron/ion coincidence set-up, several recent results on one-photon VUV PECD will be presented, including:

- Sensitivity to chemical substitutions, isomerism and conformation
- Case of floppy biomolecules such as amino acids alanine and proline with a conformer analysis and possible consequences for the origin of life's homochirality
- Analytical capabilities in terms of enantiomeric excess determination on a pure molecule as well as on a mixture of compounds.

Future trends for PECD studies will be given regarding the case of more complex/structured chiral systems as well as opportunities for time-resolved PECD opened by the recent first performance of PECD with fs HHG pulses and REMPI time-resolved PECD.