**VUV Circularly-Polarized Light as a symmetry-breaking driving force: implications for the origin of life's homochirality**

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Circularly Polarized Light (CPL) is a chiral object, and as such its interaction with chiral matter may induced enantio-specific photo-processes which could be involved in an astrophysical scenario linked to the origin of life’s homochirality, the fact that in the biosphere only L-amino acids and D-sugars are found. Assuming an extra-terrestrial formation of building blocks of life such as amino acids (aa), a possible abiotic explanation for the selection of L-amino acid could then be the exposure to CPL in space.

We have been using synchrotron radiation to simulate the VUV spectrum of light encountered in the Inter-Stellar Medium, and especially the DESIRS beamline [1] at SOLEIL providing an intense and tunable VUV CPL radiation allowing the study of photon-induced processes leading to noticeable enantiomeric excesses (e.e.) on aa.

After a broad introduction on chirality, homochirality and CPL, and on the instrumentation available on the DESIRS beamline, we will present several asymmetric photon-induced processes such as:

(i) The photon wavelength-controlled enantio-selective photolysis of racemic solid-films on alanine leading to e.e. of up to 4 %.[2]

(ii) The asymmetric photochirogenesis on CPL-irradiated interstellar achiral ice analogs (H2O, NH3, CH3OH) leading to the asymmetric production of several aa with e.e. up to 2.5 % for alanine.[3]

(iii) The one-photon photoelectron Circular Dichroism (PECD) on gas phase aa. PECD is new type of Circular Dichroism in the angular distribution of photoelectrons produced by CPL-ionization of pure enantiomers. This chiroptical effect is observed as a very intense (up to 35 %) forward/backward asymmetry (for a review see Ref.[4]). PECD happens to be a subtle probe of molecular structures such as conformers, [5] chemical substitution and isomers.[6] After a large introduction to PECD and some of its properties, we will show how the asymmetric photoemission process may lead to e.e of up to 4 % in the case of alanine[7] and 12 % for proline[8,9] at the astrophysical-relevant Lyman-a wavelength.

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