

Colloquium

SFB 956

Conditions and Impact of Star Formation

13 January 2020

Monday 3:00 pm

Physikalische Institute Köln

Lecture Hall III

Zülpicher Straße 77 | 50937 Köln

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Laboratory Astrophysics Using VUV Synchrotron Radiation

DESIRS is a high resolution/high flux variable polarization VUV (5-40 eV) beamline [1] at synchrotron SOLEIL devoted to the study, on gas phase (cold molecules to clusters and nanoparticles) and condensed matter (thin films, ices), of molecular and electronic structures, reactivity and polarization-dependant photodynamics involving valence-shell excitations. The beamline possesses several branches including: (i) a white beam branch for ultra-high resolution absorption spectroscopy based upon a VUV Fourier-Transform Spectrometer (FTS), capable of resolving power up to 10^6 [2]; (ii) a monochromatic branch connected to a versatile molecular beam/aerosols chamber equipped with a double imaging electron/ion coincidence spectrometer [3] to study photoemission on mass-selected samples, nascent or as reaction products.

All of these features provide unique opportunities in the fields of Sciences of the Universe allowing (i) to study the molecular and electronic structures (and associated dynamics) of objects encountered in astrophysical environments; (ii) to simulate in the lab the VUV spectrum of ISM and planetary ionospheres to mimic photon-induced processes; (iii) to study chemical reactivity by either preparing the reactants or probing the products of reactions.

After an introduction on these opportunities and a short description of the beamline and associated instrumentation, I'll show a few examples of recent studies including:

- High resolution absorption spectroscopy of diatomic closed-shell and radical species [4]
- Photoelectron spectroscopy of size-selected PAH clusters in link to their structures [5]
- Asymmetric VUV photon-induced processes in link with the origin of life's homochirality: photochirogenesis of amino-acids from achiral interstellar ice analogues [6] and Photoelectron Circular Dichroism on amino-acids in the gas phase [7,8]
- VUV Photoemission from Titan's aerosol analogs [9]

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[9] S. Tigrine, N. Carrasco, D. K. Bozanic, G. A. Garcia, and L. Nahon, *The Astrophysical Journal* 867, 164 (2018).