CFEL SCIENCE

SEMINAR

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via zoom: https://desy.zoom.us/j/65600698021, Meeting ID: 656 0069 8021, Passcode: 857289

Gabi Wenzel

(Department of Chemistry, Massachusetts Institute of Technology, USA)

Spectroscopy of PAHs in the Astrophysics Laboratory

About 10 – 20 % of the cosmic carbon content is locked up in a molecular family called polycyclic aromatic hydrocarbons (PAHs). As part of cosmic dust, PAHs are ubiquitous species in the interstellar medium (ISM), the space between the stars, and have recently been unambiguously detected in the dark molecular cloud TMC-1. In photodissociation regions (PDRs) of the ISM that are illuminated by nearby stars, PAHs are photoprocessed by the interaction with ultraviolet (UV) photons. Upon absorption of a UV photon, an isolated PAH can undergo a range of relaxation processes, i.e., ionization, dissociation, and radiative cooling through infrared emission. The latter gives rise to the aromatic infrared bands (AIBs) observed in many astronomical objects, but also radiative cooling via recurrent fluorescence, also known as Poincaré fluorescence, represents a relevant relaxation mechanism.

All these processes influence the charge state and photodissociation dynamics of PAHs, ultimately determining their photostability in the ISM. In return, this impacts the energy balance of the interstellar gas by photoelectric heating in PDRs. Here, PAHs potentially contribute to the formation of the most abundant molecule in space, H2. PAHs therefore play an important role in the physics and chemistry of PDRs and the ISM in general.

In this presentation, we will concentrate on astrochemically relevant PAHs and how to assess their characteristic properties employing a range of spectroscopic techniques in the astrophysics laboratory.

Host: Prof. Melanie Schnell / CFEL Molecular and Ultrafast Science Seminar / FS-SMP