

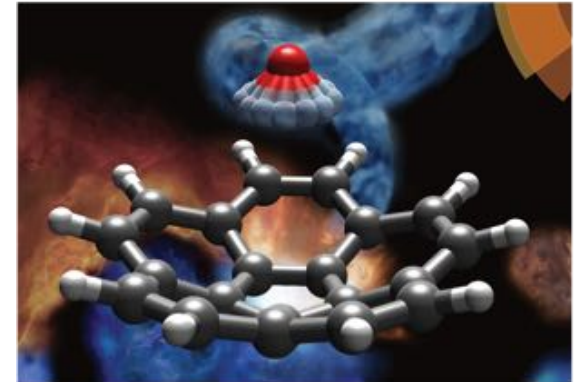
Freitag, 13. Januar 2023, 15 Uhr c.t. im Hörsaal I des Physikalischen Instituts



Melanie Schnell

DESY / Universität Kiel

„Deciphering the structure, dynamics, and chirality of astrophysically relevant molecules“



Atoms and molecules are the ambassadors of astrophysics. Detailed spectroscopic information is needed to fully exploit their potential for determining physical properties and chemical processes in space. Polycyclic aromatic hydrocarbons (PAHs) are of great interest for its potential central role in molecular astrophysics. It is assumed that they contain up to 20% of the galactic carbon, that they are present in a wide variety of interstellar environments, and dominate the spectra of almost all objects.

PAHs are also understood to play an important role in the energy balance of a galaxy. To unravel the various aspects of their impact in astrophysics, we perform a multi-spectroscopic approach covering large areas of the electromagnetic spectrum. For example, we use the Hamburg Free-Electron Laser (FEL) FLASH and perform ultrafast XUV-UV/IR pump-probe experiments to study PAH photophysics, observing ionization and dissociation as competing pathways. The analysis allows us to determine the lifetimes of electronically excited states of different PAH cations and charged fragments, which can be included into modern models. The structures and intermolecular interactions of PAHs are investigated using high-resolution chirped-pulse rotational spectroscopy in our lab and infrared spectroscopy using the Free-Electron Laser (FEL) FELIX in Nijmegen in the gas phase.

In a related branch of research, we focus on characterizing, controlling, and finally manipulating chirality. Chirality is ubiquitous in nature and involved in many aspects of life, making it an important phenomenon. Using the coherent, non-linear, and resonant microwave three-wave mixing approach, we can differentiate enantiomeric pairs of chiral molecules using tailored microwave pulses. The technique is uniquely mixture-compatible and allows for enantiomer separation.

In my presentation, I will provide an overview of our research activities on PAHs and chiral molecules discuss some of the latest results.