

7th February 2019 - 10:00
Building 99, Seminar Room I+II (EG)

Bastian Manschwetus

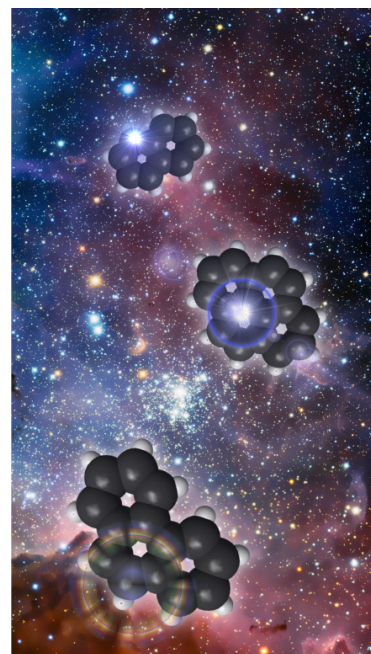
Deutsches Elektronen Synchrotron (DESY)

Ultrafast ionization and fragmentation dynamics of polycyclic aromatic hydrocarbons (PAH) by XUV radiation

The interstellar medium (ISM) shows a surprisingly complex radiation driven organic chemistry. Hydrocarbon molecules in many different forms are known there, one important species are the polycyclic aromatic hydrocarbons. These species are very abundant in the galaxy, estimations from the characteristic IR emission bands of these molecules show that roughly 20% of carbon in the Milky Way exists in this form [1].

The molecules are exposed to very harsh conditions in the ISM due to strong ionizing particle and photon radiation and low temperatures, complex fragmentation and isomerization reactions take place [2]. To explore these reaction processes on femtosecond timescales we performed pump probe experiments using the FLASH free electron laser facility.

Here I will present our recent results, where we ionized three small PAHs fluorene, phenanthrene and pyrene by XUV radiation at 30.3 nm wavelength and probed the reaction dynamics using optical laser pulses at 800 nm wavelength. Complex fragmentation patterns are observed for all three PAHs: multiple hydrogen abstraction and cascading acetylene loss, with more pronounced fragmentation for the parent dications than for the cation. Characteristic timescales for the femtosecond decay process after ionization could be retrieved.



[1] Joblin, C.; Tielens, A. "25 years of PAH hypothesis" European Astronomical Society Publications Series 2011, 46, 3-10.

[2] Herbst, E.; van Dishoeck, E. F. "Complex Organic Interstellar Molecules" Annual Review of Astronomy and Astrophysics 2009, 47, 427-480