

# PTPC2019

Contribution ID: 18

Type: not specified

## Unravelling ultrafast dynamics of polycyclic aromatic hydrocarbons upon photoionization using extreme ultraviolet radiation

*Wednesday, 9 January 2019 10:10 (15 minutes)*

Polycyclic aromatic hydrocarbons (PAHs) are assumed to be key players in interstellar chemistry [1]. Their interaction with energy-rich radiation can trigger the competing processes of ionization, fragmentation and dehydrogenation. Ultra-short pulses of ionizing radiation in a pump-probe experiment present a powerful tool to disentangle the underlying chemical processes that may occur during these events in the interstellar medium.

In this work, we present results from our study of the ultrafast fragmentation of three medium sized PAHs - fluorene, phenanthrene and pyrene. These molecules were ionized using extreme ultraviolet radiation at 30.3 nm provided by the free-electron laser (FEL) at Hamburg, FLASH [2]. Their reaction dynamics in the femtosecond regime were probed using 800 nm NIR pulses which were temporally delayed relative to the pump FEL pulse. This allowed us to observe the time dependent yield of different ion channels produced during the interaction. The goal of these experiments was to determine the lifetimes of the excited cationic PAHs following extreme ultraviolet excitation, and to identify the preferred reaction pathways of these molecules under such conditions. Here, we will present recent insights from our analysis.

[1] EAS Publications Series, 2011, 46, 3.

[2] J. Phys. B, 2010, 43,194002

**Primary author:** CHOPRA, Pragya (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany; Institute of Physical Chemistry, Christians-Albrecht-Universität zu Kiel, Kiel, Germany; The Hamburg Centre for Ultrafast Imaging, Universität Hamburg, Hamburg, Germany)

**Co-authors:** LEMMENS, Alexander (Radboud University, FELIX Laboratory, The Netherlands; Van't Hoff Institute for Molecular Sciences, University of Amsterdam, The Netherlands); STEBER, Amanda (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany; Institute of Physical Chemistry, Christians-Albrecht-Universität zu Kiel, Kiel, Germany; The Hamburg Centre for Ultrafast Imaging, Universität Hamburg, Hamburg, Germany); RIJS, Anouk (Radboud University, FELIX Laboratory, The Netherlands); MANSCHWETUS, Bastian (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany); ERK, Benjamin (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany); PASSOW, Christopher (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany); VAL-LANCE, Claire (The Chemistry Research Laboratory, University of Oxford, United Kingdom); RAMM, Daniel (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany); ROLLES, Daniel (Kansas State University, Kansas, USA); HEATHCOTE, David (The Chemistry Research Laboratory, University of Oxford, United Kingdom); ROMPO-TIS, Dimitrios (European XFEL GmbH, Schenefeld, Germany); LORU, Donatella (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany; Institute of Physical Chemistry, Christians-Albrecht-Universität zu Kiel, Kiel, Germany; The Hamburg Centre for Ultrafast Imaging, Universität Hamburg, Hamburg, Germany); ZIAEE, Farzaneh (Kansas State University, Kansas, USA); ALLUM, Felix (The Chemistry Research Laboratory, University of Oxford, United Kingdom); KÖCKERT, Hansjochen (The Chemistry Research Laboratory, University of Oxford, United Kingdom); LAHL, Jan (Department of Physics, Lund University, Sweden); LEE, Jason (The Chemistry Research Laboratory, University of Oxford, United Kingdom); PESCHEL, Jasper (Department of Physics, Lund University, Sweden); KÜPPER, Jochen (Center for Free-Electron Laser Science (CFEL), Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany; The Hamburg Centre for Ultrafast Imaging, Universität Hamburg, Hamburg, Germany; Department of Physics, Universität Hamburg, Hamburg, Germany); WIESE, Joss (Center for Free-Electron Laser Science (CFEL), Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany); HE, Lanhai (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany); BROUARD, Mark (The Chemistry Research Laboratory, University

of Oxford, United Kingdom); KAZEMI, Mehdi Mohammad (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany); SCHNELL, Melanie (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany; Institute of Physical Chemistry, Christians-Albrecht-Universität zu Kiel, Kiel, Germany; The Hamburg Centre for Ultrafast Imaging, Universität Hamburg, Hamburg, Germany); JOHNY, Melby (Center for Free-Electron Laser Science (CFEL), Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany); BURT, Michael (The Chemistry Research Laboratory, University of Oxford, United Kingdom); SCHIRMEL, Nora (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany); OLSHIN, Pavel (Saint Petersburg State University, Saint Petersburg, Russia); JOHNSSON, Per (Department of Physics, Lund University, Sweden); BOLL, Rebecca (European XFEL GmbH, Schenefeld, Germany); MASON, Robert (The Chemistry Research Laboratory, University of Oxford, United Kingdom); BARI, Sadia (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany); TRIPPEL, Sebastian (Center for Free-Electron Laser Science (CFEL), Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany; The Hamburg Centre for Ultrafast Imaging, Universität Hamburg, Hamburg, Germany); DÖRNER, Simon (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany); MACLOT, Sylvain (Department of Physics, Lund University, Sweden); GRUET, Sébastien (Laboratoire de Physique des Lasers, Atomes et Molécules, Université Lille, France); MULLINS, Terrence (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany); CHENG, Xuemei (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany)

**Presenter:** CHOPRA, Pragma (Deutsches Elektronen Synchrotron (DESY), Hamburg, Germany; Institute of Physical Chemistry, Christians-Albrecht-Universität zu Kiel, Kiel, Germany; The Hamburg Centre for Ultrafast Imaging, Universität Hamburg, Hamburg, Germany)

**Session Classification:** Time-resolved techniques