



IMPRS UFAST Call for PhD applications 2020/2021



Recording the molecular movie of chemical dynamics through coherent x-ray diffractive imaging of fixed-in-space molecules

J. Küpper-2

Title of PhD Project	Recording the molecular movie of chemical dynamics through coherent x-ray diffractive imaging of fixed-in-space molecules
Type	Experimental
Supervisor(s)	Prof. Jochen Küpper
Affiliation(s):	Center for Free-Electron Laser Science, Deutsches Elektronen-Synchrotron (DESY) & Universität Hamburg
Number of positions:	1
Abstract:	<p>Unraveling the atomic-scale dynamics of (bio)chemical processes is at the heart of the molecular sciences. Coherent x-ray diffractive imaging of many identical molecules undergoing the same dynamics and directly in the molecular frame provides the information to observe the chemical processes in detail and to disentangle the key modes of chemistry. Here, we aim at recording full atomic-scale movies of the chemical reactions of bi-molecular reactions of complex molecules, including investigations of microsolvation. We have all the tools at hand to create samples of individual well-defined species, to fix these molecules in space, and to analyze the diffractive imaging patterns. Furthermore, we have implemented and commissioned the COMO endstation extension at European XFEL, already implement all these advanced technologies in the XFEL experiment. The main duties are to actually perform the experiments, to analyze the diffraction data, and to unravel the chemical dynamics observed in order to develop novel textbook models of chemistry. We are looking for a highly motivated individual with a strong background in experimental AMO physics or gas-phase physical chemistry as well as in quantum mechanics and optics. Knowledge of molecular-beams, diffractive imaging, ultrafast lasers as well as capabilities for programming are necessary and need to be present or acquired within the first part of the project. Küpper, <i>et int</i>, Chapman: X-ray diffraction from isolated and strongly aligned gas-phase molecules with a free-electron laser. Physical Review Letters 112, 083002 (2014).</p>
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