

# Max-Planck-Institut für Struktur und Dynamik der Materie

Max Planck Institute for the Structure and Dynamics of Matter



## IMPRS UFAST Call for PhD applications 2023/2024

### JK2- Investigating solvent effects in the dynamics of biologically relevant model systems

<b>Title of PhD Project</b>	<b>Investigating solvent effects in the dynamics of biologically relevant model systems</b>
<b>Type</b>	Experimental
<b>Supervisor(s)</b>	Prof. Jochen Küpper & Dr. Sebastian Trippel
<b>Affiliation(s):</b>	DESY, CFEL, UHH
<b>Number of positions:</b>	1
<b>Abstract:</b>	<p>The dynamics of molecules strongly depends on the environment, for instance, their interaction with solvents. Moreover, hydrogen bonds are of universal importance in general chemistry and biochemistry and it is of great interest to bridge the gap between single isolated molecules and molecules in solvation.</p> <p>In this collaborative project, the influence of a few water molecules attached to building blocks of life, e.g., nucleobases such as adenine, thymine, or uracil, will be investigated in terms of photo-induced ultrafast electronic dynamics. Beams of size selected clusters will be prepared with the advanced technologies available in our group in Hamburg and then studied using photoelectron- and photoion-coincidence-imaging techniques. Recording and correlating all photo fragments allows for a reconstruction of the complete dynamics, potentially even in the molecular frame - that is as if "we were sitting on the molecule".</p> <p>Furthermore, the dynamics of specific and unspecific hydrogen bond interactions will be investigated by varying the distance between the solvent and the biomolecule while studying the induced photo-driven processes. The above-mentioned studies will be performed in an ultrahigh vacuum using molecular beams and light sources such as high-intensity lasers, synchrotrons, and free-electron lasers (FELs).</p> <p>This research project is connected to the collaborative research program "Ultrafast dynamics in intermolecular energy transfer: elementary processes in aerosols and liquid chemistry" (UDIET) with partners in Lund (Per Johnsson and <a href="#">Mathieu Gisselbrecht</a>) and Hamburg (Francesca Calegari and Jochen Küpper). A university degree in physics, chemical physics, or in a comparable relevant field is required. Preference will be given to candidates with a completed MSc. We expect experience in areas covering quantum mechanics, molecular physics, molecular dynamics, molecular beams, vacuum equipment, ultrafast laser sources including optics, and (Python) programming. Experience with large-scale facilities such as synchrotrons or free-electron lasers is an advantage.</p>
<b>Contact person for scientific questions about the project:</b>	Prof. Jochen Küpper: <a href="mailto:jochen.kuepper@cfel.de">jochen.kuepper@cfel.de</a> Dr. Sebastian Trippel: <a href="mailto:sebastian.trippel@cfel.de">sebastian.trippel@cfel.de</a>



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