Electrospray aerosolization

PhD / PostDoc project

CFEL SCIENCE
Controlled Molecule Imaging

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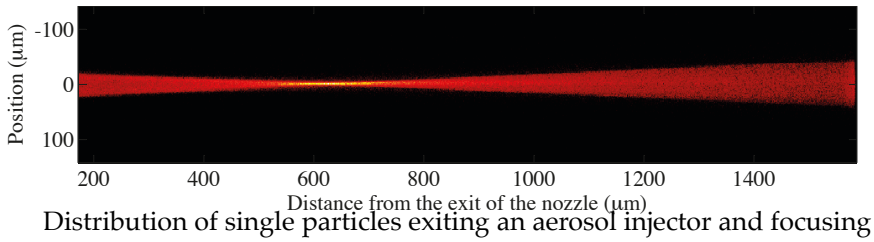
The Controlled Molecule Imaging group at the Center for Free-Electron Laser Science at DESY and Universität Hamburg performs novel experiments on the control and imaging of gas-phase molecules and their ultrafast dynamics with applications in fundamental physics, chemistry and structural biology.

We develop new experimental approaches to cool and control complex molecules, such as spatial separation of individual molecular species, alignment and orientation of molecules in space, and the creation of well-defined molecular wavepackets. We image molecular structures and dynamics — recording movies of molecules at work — using ion and electron imaging as well as coherent diffractive imaging techniques with x-rays and electrons. This work is accompanied by sophisticated data analysis, computational modeling, and *ab initio* theory developments.

Electrospray aerosolization of biological systems and nanoparticles

You will develop novel approaches to electrospray ionization and nebulization to introduce intact nanoparticles and biological samples into the gas-phase. You will work towards sources that produce smaller droplets and higher aerosol densities in vacuum, for example through parallelization. You will furthermore work towards a softer aerosolization procedure, ensuring fragile biological samples survive the process intact. This will be combined with ongoing developments of buffer-gas-cooling approaches and aerodynamic-focusing-lens systems within the group in order to produce dense, focused or collimated beams of intact and shock-frozen biological samples or nanoparticles.



Distribution of single particles exiting an aerosol injector and focusing in free space.

The developed experimental setups will be employed for novel diffractive-imaging experiments, both at FEL facilities as well as in laboratory based setups.

Struct. Dyn. **2**, 041717 (2015) – DOI: 10.1063/1.4922648
Opt. Exp. **24**, 6507 (2016) – DOI: 10.1364/OE.24.006507

CMI offers unique research opportunities in an interesting, open, international team and with first-class experimental and computational facilities. Our group is embedded in the Center for Free-Electron-Laser Science, Deutsches Elektronen-Synchrotron DESY, Universität Hamburg, and the Hamburg Center for Ultrafast Imaging.

https://www.controlled-molecule-imaging.org

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