



SEMINAR

2 May 2024, 10:00–11:00h
CFEL (Bldg. 99) seminar room I+II

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Dynamics induced by electron collisions: gas phase, clusters, liquids

I will discuss processes induced by impact of free electrons in systems with increasing degree of aggregation.

For gas-phase molecules, the motivation primarily comes from the fundamental aspects of quantum dynamics. In an electron-molecule collision system, resonances (states embedded in electronic continuum) can be formed and the nuclear dynamics on these states often leads to effects which are not commonly encountered in other types of vertical excitation (e.g., photoexcitation), such as nuclear interference or non-locality. Experimentally, we use two-dimensional electron energy loss spectroscopy (2D EELS) to monitor the decay channels of resonances and to extract the dynamical information from these. I will describe the extremely non-Born-Oppenheimer dynamics in CO₂ [1] and contrasting dynamics in isoelectronic anions [2].

Experiments with clusters enable to probe how such dynamics changes upon elementary aggregation. In view of the biological relevance of electron-induced processes, especially interesting are experiments with microhydrated molecules, where the active target is surrounded by a controlled number of water molecules. It can lead to a dramatic change in the outcome of the electron-induced reactions [3, 4].

In the last part of my talk, I will describe our current experiments on electron collisions with liquid microjets where the main goal is the implementation of EELS for liquid targets.

[1] J. Dvořák et al, Phys. Rev. Lett. 2022, <https://doi.org/10.1103/PhysRevLett.129.013401>

[2] P. Nag et al., J. Phys. Chem. Lett. 2024, <https://doi.org/10.1021/acs.jpclett.3c03460>

[3] J. Kočíšek et al., J. Phys. Chem. Lett. 2016, <https://doi.org/10.1021/acs.jpclett.6b01601>

[4] R. Meissner et al., Nature Comm. 2019, <https://doi.org/10.1038/s41467-019-10340-8>