ELECTRON-ION COINCIDENCE EXPERIMENTS WITH ELECTRON AND PHOTON IONIZATION

MINNA PATANEN

Nano and molecular systems research unit, Faculty of Science, P.O. Box 3000, 90014 university of Oulu, Finland
E–mail minna.patanen@oulu.fi

Abstract. Chemical reactions take place at the atomic level where electrons, following the laws of quantum mechanics, move from one atom to another, forming and breaking molecular bonds. Thus complex processes such as catalysis, protein folding, and photosynthesis are triggered at the atomic level when a part of the complicated system changes its quantum state. A complete understanding of for example radiation damage of living matter thus requires an atomic scale description of radiation induced process. These initial steps determine what kind of particles are released, e.g. energetic electrons, low kinetic energy electrons, and free radicals, which further interact with surroundings leading to final radiation damage. Electron - ion coincidence experiments provide a tool for capturing simultaneously charged reactants resulting from radiation - matter interaction event, and are thus a key forward for complete understanding of the process. In this talk I will concentrate on recent examples of electron - ion coincidence experiments performed at a synchrotron radiation facility MAX IV for a large organic molecule (Abid et al. 2020) and using a laboratory electron source ionising for mixed argon - water clusters (Pelimanni et al. 2022). In these gas-phase experiments, the electron detection using a hemisperical electron analyser allows selection of a specific site of ionisation while correlation between detected ions can give hints for the specific mechanisms of the fragmentation.

References

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