Radiation damage and protection in microsolvated biomolecules

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Solvation effects have a strong influence on the structure and function of complex biological systems. For instance, the photophysical and photochemical properties of UV absorbing model chromophores, such as indole or pyrrole, are sensitive to their local hydration environment. Despite huge efforts to shed light into realistic dynamics, the role of hydration environment on the radiation-induced biological damage is not well understood so far. In our experiments, pure samples of bimolecular hydrogen-bonded clusters of pyrrole or indole with water are provided using a combination of a cold molecular beam and the electrostatic deflector [1]. Photoion-photoion coincidence imaging was employed to study the fragmentation dynamics of the bare molecule as well as the cluster after strong field ionization making use of the TimePix3 camera [2, 3]. Changes in the fragmentation dynamics following strong-field ionization occur due to the solvation. Alternatively, pump-probe experiments allow to follow electronic and structural dynamics during dissociation.

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