Electron Interactions with Biomolecular Models of Increasing Complexity

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We experimentally probed interaction of low energy electrons (<10eV) with biomolecular models in gas phase and clusters. These experiments enable us to explore the effects of molecular as well as environmental complexity on the dissociative electron attachment (DEA).

An important motive in DNA bases is HNCO, which we studied isolated in the gas phase.[1] We demonstrated importance of the σ^*-π^* mixing in the DEA process, as well as the importance of the intramolecular energy transfer during the dissociation.

In DNA bases, the HNCO component undergoes effective hydrogen loss via DEA forming typical $(M\text{-}H)^-$ DNA base radical anions. In our study [2], we demonstrated closing of this dissociation channel by the water environment. Such closing is caused by caging of the dissociation products and intermolecular energy transfer as demonstrated in our work [3].

In more complex biomolecules such as the nucleotides, electron transfer can influence the dissociation.[4] In our study of DEA to dCMP, we demonstrated that in water environment hydrogenation of the transient negative anion may dramatically change the fragmentation and final charge redistribution over the molecule [5].

We acknowledge the support by Czech Science Foundation grant no 19-01159S and Czech Ministry of Education Youth and Sports via OP RDE Grant no. CZ.02.2.69/0.0/16_027/0008355.

References

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