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Destruction of uracil and thymine at subexcitation energies

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Free electron attachment to gas phase uracil (U) and thymine (T) leads exclusively to the formation of fragment anions. In the electron energy range between 1 and 3 eV the attachment cross section of the most dominant products (U-H)⁻ and (T-H)⁻ reveals several narrow resonances [1]. By using partially deuterated T with deuterium connected to all carbon atoms it is possible to show that all these resonances originate from the abstraction of hydrogen from the two nitrogen sites [2]. However, in DNA the hydrogen atom where T is connected to the sugar is missing and the other H atom is part of a hydrogen bridge to adenine. Attachment cross sections for the H abstraction from thymidine and 1-methyl-thymine show a single asymmetric resonance at about 2 eV and enable us to distinguish between the two nitrogen positions. For the formation of H⁻ from U and T the attachment cross section shows several resonances in the energy range between 5 and 12 eV. Experiments with partly deuterated T show that the different peaks in the H⁻ ion yield can unambiguously be associated to abstraction from the different molecular sites [3]. The energy dependence for H⁻ abstraction from the carbon sites shows a remarkable resemblance to the energy dependence of strand breaks observed in plasmid DNA [4] suggesting that this reaction may be an important initial step towards strand breaks. In collaboration with Sylwia Ptasińska, Stephan Denifl, Stefan Feil, Manuel Winkler, Barbara Mroz, Michael Probst, Stefan Matejcik, Department of Plasma Physics, Bratislava; Eugen Illenberger, Institute of Chemistry, FU-Berlin; Tilmann Märk, and the Center of Molecular Biosciences Innsbruck Team.

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