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Temporary Negative Ions and Bond-breaking in Bio-molecules[1]

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Strand-breaks in DNA are known to be induced by electron impact through the dissociative electron attachment (DEA) process. These discoveries have stimulated gas phase studies of electron collisions with the components of DNA as well as other bio-molecules such as the amino acids. We describe the various types of resonances possessed by the DNA/RNA bases, focusing on the role played by vibrational Feshbach resonances (VFRs) produced by the supercritical electric dipole moments of these molecules. We have proposed that the sharp structure in the DEA cross sections arises from mixing of VFRs with temporary valence anion states of Σ symmetry, and we offer theoretical support for this picture. Finally, we discuss the current status of measurements of absolute DEA cross sections in these compounds.

[1]In collaboration with G.A. Gallup, K. Aflatooni and A.M. Scheer