

SCIENTIFIC REPORT

Title: Low energy electron induced reactions in organic acids

REFERENCE: Short Term Scientific Mission, COST CM0601

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Host: Prof. Dr. Eugen Illenberger, Freie Universität Berlin

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Purpose of the visit

The purpose of the visit was to investigate interaction of the low energy electrons with gas phase molecules by means of crossed electron/molecular beams technique.

Description of the work carried out

The experiments were performed in a crossed electron/molecular beam setup which consists of an electron source, an oven, a quadrupole mass analyzer and a detection system. The electron beam of the defined energy is generated by a trochoidal electron monochromator and crosses perpendicularly with the molecular beam under investigation. The generated negative ions are extracted by a weak electric field and accelerated by a series of parallel electrodes onto the entrance hole of the quadrupole mass analyzer and detected by a single pulse counting technique as a function of incident electron energy. Calibration of the electron energy scale and estimation of the electron energy was established using the well-known electron attachment process $\text{SF}_6^-/\text{SF}_6$.

Description of the main results obtained

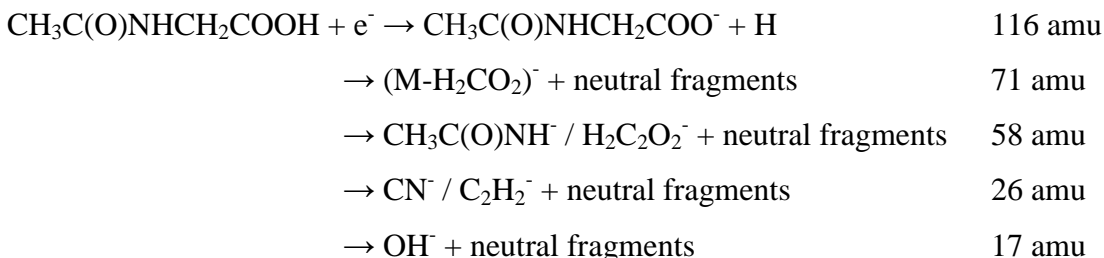
During my stay in the Berlin laboratory I was involved in the study of the 4-oxopentanoic acid, N-acetylglycine and cis-platin compounds by electron attachment.

4-oxopentanoic acid

The only anionic fragment that was observed from 4-oxopentanoic acid is the closed shell anion $(\text{M-H})^-$ which arise from the loss of a neutral hydrogen atom. The fragment is visible within the peak at 1.5 eV.

N-acetylglycine

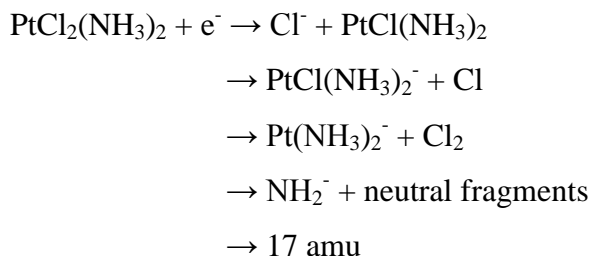
Low energy electron interaction with N-acetylglycine leads to the formation of the following fragment negative ions:



The most intensive signal was observed at 116 amu and assigned as (M-H)⁻. The formation of this ion results via a simple bond cleavage and is observed via low energy resonance at 0.8 eV with a shoulder at around 1.8 eV. The other two quite intensive resonances at 71 amu and 58 amu appear at 0.8 eV and 1.4 eV, respectively. While the former fragment is assigned as (M-H₂CO₂)⁻ the assignment of the latter one is ambiguous since there are two possible structures of the anionic product such as CH₃C(O)NH⁻ and H₂C₂O₂⁻. As for the fragment at 58 amu two structures are possible for the fragment detected at 26 amu, i.e., CN⁻ and C₂H₂⁻. Besides, the fragment at 17 amu (OH⁻) was observed within two resonances first at low energy, slightly above zero eV, and the second one at around 6 eV.

Cis-platin

The experiment performed on cis-platin has shown that interaction of LEEs with this molecule leads to dissociation into various fragments. The anionic dissociation products are caused by following reaction pathways:



All of these anionic fragments are observed at low energy scale in the range of 0-1 eV and the only fragment NH_2^- is created at high energy of 5.5-6 eV and hence attributed to a core excited resonance.

Projected publications resulting from the grant

It is planned to publish the results as soon as the data analysis will be finished.