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REFERENCE: Short Term Scientific Mission, COST P9  
Beneficiary: Diogo Almeida, New University of Lisbon  
Host: Prof. Dr. Paul Scheier, University of Innsbruck, Innsbruck, Austria  
Period: from 11/01/2007 to 24/01/2007 Place: Innsbruck - Austria  
Reference code: COST-STSM-P9-00206

## **SCIENTIFIC REPORT**

### ***PURPOSE OF VISIT***

As previous studies have pointed out, the process of electron attachment by biological relevant molecules is thought to be a very important key mechanism behind the interactions of high energy radiation with the physiological environment. Due to the obvious medical implications, one of the most important studies is the effect of electron interaction in DNA components. It was shown that these electrons, even at low energies ( $< 20$  eV), are potentially damaging to these molecules due to the formation of transient negative ions.

As such, the study of the negative ion fragments that result from the electron attachment experiments with various other biological relevant molecules, mainly aminoacids, provides an important contribution to better understanding the degradation mechanisms by these ballistic electrons.

We took advantage of an apparatus equipped with an electric field sector and a magnetic mass selector, to look at free-electron attachment experiments with aminoacids (glycine and alanine). The ion yields were obtained as a function of the electron energy. The present configuration of the set-up allows also MIKE scans to be taken. Glycine was used as being the most simple  $\alpha$ -aminoacid, and therefore a starting study molecule of other more complex aminoacids, from both a theoretical and experimental point-of-view.

### ***DESCRIPTION OF THE WORK CARRIED OUT DURING THE VISIT***

During the course of my visit, the people with whom I have been working were mainly a Post-Doc (Stefan Denifl) and a PhD student (Nina Wendt). The main research goal was to obtain negative ion spectra from electron attachment experiments to biomolecules, mainly some aminoacids (Glycine and Alanine). Nitrotoluene measurements were on going and I also had the chance to take part on that. However, we have been facing some technical problems, mainly with the heating of the oven where these molecules are vaporised. An improved temperature regulation is planned to be implemented in the near future. For glycine, a precise temperature control was needed and also, a significant amount of water was detected in the spectra obtained during the first days. The nature of that hydration was not completely determined. I got slightly acquainted with some of the other experiments going on in the laboratory, mainly the one dealing with helium clusters doped with heavy water.

## ***DESCRIPTION OF THE MAIN RESULTS OBTAINED***

- Negative ion yields of glycine;
- Mass, appearance energy and also MIKE scans for some of the glycine molecular fragments were obtained.
- Separation of isobaric anions with a nominal mass of 15, 16 and 26 amu by high resolution mass spectrometry. The present results show that often different resonances in the anion efficiency curves can be assigned to different fragments. For example  $\text{NH}_2^-$  and  $\text{O}^-$  at 16 amu.

## ***FUTURE COLLABORATION WITH HOST INSTITUTIONS***

Due to the link with the Innsbruck laboratory, the study of other relevant biomolecular targets is being planned for the near future. A possible visit to Paul Scheier's lab is also planned.

## ***PROJECTED PUBLICATIONS/ARTICLES RESULTING OR TO RESULT FROM THE STSM***

The results to be obtained will certainly be worked up in order to prepare at least one joint publication to be submitted to an international journal as soon as possible.

Mr. Diogo Almeida

Lisbon, 5<sup>th</sup> February 2007.

## ***CONFIRMATION BY THE HOST INSTITUTE OF THE SUCCESSFUL EXECUTION OF THE MISSION***

The visit of Mr Diogo Almeida was accomplished with success and according to the planned activities.

Prof. Dr. Paul Scheier

Innsbruck, 5<sup>th</sup> February 2007.