

Rui PARAFITA

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Supervisor: Paulo Limão-Vieira

REFERENCE: Short Term Scientific Mission, EIPAM

Beneficiary: Rui PARAFITA, New University of Lisbon, Portugal

Host: Prof. M-J Hubin-Franskin, University of Liège, Liège, Belgium

Period: from 16/08/2004 to 22/08/2004 Place: Liège - Belgium

Reference code: EIPAM

SCIENTIFIC REPORT

PURPOSE OF THE VISIT

The purpose of the visit was to understand and study the interaction of free electrons with some alternative plasma processing species: perfluorocyclobutane ($c\text{-C}_4\text{F}_8$) and octafluorocyclopentene ($c\text{-C}_5\text{F}_8$) and bio molecules (acetic acid and water), that would give complementary information on the electronic state spectroscopy and the dissociation accessible mechanisms of such compounds.

DESCRIPTION OF THE WORK CARRIED OUT DURING THE VISIT

During my visit I was acquainted with the undergoing research activities at the Laboratoire de Spectroscopie d'Electrons Diffusés and Laboratoire de Thermodynamique et Spectroscopie, University of Liège, Belgium, under the supervision of Prof. Marie-Jeanne Hubin-Franskin, Dr. Alexandre Giuliani and Prof. Jacques Delwiche, respectively. I had a chance to get involved in both research set-ups: valence shell electron energy loss spectroscopy and He(I) photoelectron spectroscopy.

Since no data on the ionisation energies for both cyclic compounds is available (with the exception of a recent threshold photoelectron measurements for $c\text{-C}_4\text{F}_8$), we performed He(I) photoelectron measurements in order to characterise the ionic states and assign the Rydberg series found in previous high-resolution VUV photo-absorption measurements obtained by my supervisor and co-workers at the Institute for Storage Ring Facilities, University of Aarhus, Denmark.

This first visit has been extremely interesting from the point of view of new experimental techniques to study the electronic state spectroscopy and the possibilities to undergo future research plans on biomolecules throughout my research studies during the next following years.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

- The first obtained He(I) photoelectron spectra for c-C₄F₈ and c-C₅F₈;
- High resolution valence shell EELS for both cyclo compounds and acetic acid at pseudo-optical conditions;
- High resolution He(I) photoelectron spectrum for acetic acid.

FUTURE COLLABORATION WITH HOST INSTITUTIONS

Future collaboration with host institution is planned in the area of electronic state spectroscopy of molecules, mainly devoted to biomolecules. The Belgian group that has a proved experience in the study of electron scattering processes, has two different set-ups: one for studying the electronic state spectroscopy of valence shell and the other for inner core shells. It has also a photoelectron spectrometer, where the information provided is extremely useful to characterise the Rydberg and ionic states.

PROJECTED PUBLICATIONS/ARTICLES RESULTING OR TO RESULT FROM THE STSM

At this moment at least two joint publications in international journals are planned for the electronic state spectroscopy of c-C₅F₈ and c-C₄F₈ and the other for acetic acid.

Rui Parafita

Lisbon, August 26, 2004.

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

The visit of Mr. Rui Parafita was underdone with success and according to the planed activities.

Prof. Marie-Jeanne Hubin-Franskin

Liège, August 26, 2004.