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REFERENCE: Short Term Scientific Mission, COST P9  
Beneficiary: Dr Bratislav Marinkovic, Institute of Physics, Belgrade  
Host: Nigel Mason, The Open University  
Period: from 1/11/2006 to 7/11/2006 Place: Milton Keynes (GB)  
Reference code: COST-STSM-P9-02338

## **SCIENTIFIC REPORT**

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

This visit was undertaken to foster the collaboration between two groups associated with the RADAM COST Action P9, i.e. between leaders of two laboratories: Laboratory for Atomic Collision Processes, Belgrade (CS) and Centre of Molecular and Optical Studies, The Open University, Milton Keynes (GB) and two members of the Management Committee. The purpose of the visit was the collaborative work on photoabsorption measurements at Daresbury synchrotron radiation installation. Several different type of molecules were planned to be investigated that are of interest in radiation damage investigations.

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

During the visit B. Marinkovic was acquainted with the undergoing research activities at Centre of Molecular and Optical Studies, The Open University, Milton Keynes (GB) and their programme of research connected to synchrotron radiation measurements. The work carried out during the visit included photoabsorption measurements of UV radiation by nitrous-oxide (N<sub>2</sub>O), cyanoacetylene (HCCCN), 3-carene (C<sub>10</sub>H<sub>16</sub>) and nonylbenzene (C<sub>15</sub>H<sub>24</sub>) molecules.

The photoabsorption cross sections of nitrous oxide molecules have been a long standing problem of accurate determination of the optical oscillator strengths for the transitions in the first  $\Pi$  and  $\Sigma$  valence states. On the other hand this molecule plays a significant role in stratospheric ozone depletion processes, global warming processes as a greenhouse gas producing approximately 300 the effect of carbon dioxide, as well as in neuropharmacology.

Photoabsorption spectra of cyanoacetylene was investigated in spectral regions from 105-110 nm, 105 – 180 nm and 100 -320 nm in very fine, fine and larger steps. Very strong absorption bands were found in the region from 130 to 150 nm, medium size cross section at 205 nm and two very weak bands in the region from 195 to 230 nm and from 250 to 300 nm.

Molecule of 3-carene is a bicyclic monoterpene, a substance that could be found in resins as natural products of some trees. Its formula could be presented as C<sub>10</sub>H<sub>16</sub>.

Nonylbenzene is a molecule that contains benzene ring and hydrocarbon radical C<sub>9</sub>H<sub>19</sub> known as nonyl. Isomers of the formula C<sub>15</sub>H<sub>24</sub> are called sesquiterpenes (SQT) and these molecules were found in emissions from vegetation.

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

- Photoabsorption cross sections of N<sub>2</sub>O molecule.
- Spectra of cyanoacetylene (HCCCN).
- Molecule of 3-carene was investigated in terms of UV absorption spectroscopy divided into several regions of interest: 100 – 165 nm, 125 – 235 nm and 220 – 300 nm. These spectra had been obtained in high resolution.
- Investigation of nonylbenzene molecule had been started in the range of 105 – 320 nm

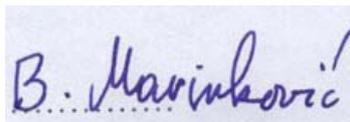
## ***FUTURE COLLABORATION WITH HOST INSTITUTIONS***

The future collaboration with host institution is envisaged in the area of binary collisions of electrons with molecules and comparative studies of optical absorption measurements. These include measurements of excitation electron energy loss spectra, determination of optical oscillator strengths as well as elastic electron cross section measurements.

The visit of PhD student, Predrag Kolarz, from Belgrade Laboratory for Atomic Collision Processes to Daresbury synchrotron radiation facility is scheduled for this year. It will be within the current projects devoted to better understanding of damage induced by UV radiation to biologically interested matters.

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

Joint publications are anticipated in near future partly covering the results obtained within this scientific mission. Prof. N. J. Mason has been already participated in the Symposium on physics of ionized gases organized in Serbia and his next visit is foreseen during the March 2007 plasma meeting in Belgrade.



Dr. Bratislav Marinkovic  
Institute of Physics, Belgrade  
Head of Laboratory for Atomic Collision Processes

Belgrade, 09.11.2006

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

The visit of Dr. Bratislav Marinkovic was underdone with success and according the planned activities.



Prof. N. J. Mason  
Director of Research  
Centre for Molecular and Optical Studies

Milton Keynes, 09.11.2006