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REFERENCE: COST-STSM-P9-02753

Beneficiary: Paulo LIMA-O-VIEIRA, New University of Lisbon, PT

Host: Prof. Nigel John Mason, The Open University, UK

Period: from 11/04/2007 to 02/05/2007 Place: Milton Keynes - UK

SCIENTIFIC REPORT

PURPOSE OF VISIT

The physical and chemical effects of ionizing radiation on cellular membranes remains largely unknown. During this STSM we studied a structural mimic of biological membranes (formed by deposition of sequential layers obtained by the 'layer-by-layer' technique using common polyelectrolytes, functional polymers and biological molecule) to study the effect of radiation damage in soft condensed biological materials when submitted to irradiation by X-rays, electrons and UV radiation. This visit also aimed to discuss and finish a set of manuscripts on the VUV electronic state spectroscopy of biological relevant molecules that have been measured recently by the Portuguese and the UK groups on acetone and pyrimidine.

DESCRIPTION OF THE WORK CARRIED OUT DURING THE VISIT

During this STSM, it was possible to analyse some of the data previously obtained at the Daresbury synchrotron facility, where thin films of DNA and DNA nucleotides have been deposited on CaF₂ substrates and irradiated with VUV light as a function of time. By making use of an electron gun (50 – 1keV) at the Open University, irradiation of those films was obtained with the main goal to look at chemical changes or structural modifications (damage). Some of the irradiated films have been characterised by FTIR spectroscopy to check whether induced modifications may have occurred.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

The main results obtained following the:

- DNA nucleotides thin films irradiation with VUV synchrotron light have shown absorption features relevant to ($n \rightarrow \pi^*$) and ($\pi \rightarrow \pi^*$) transitions in the purines (adenine and guanine) showing an apparent red shift to the results in the gas phase. Time dependence irradiation (> 1 hour) seems to show that chemical changes may occur with possible new bond being formed, which is also supported by FTIR investigations;
- Electron gun irradiation of thin films has shown for the specific case of cytosine change in the chemical bonds, which has been confirmed by FTIR measurements;

FUTURE COLLABORATION WITH HOST INSTITUTION

This research programme will continue through the exchange of post-graduate students in the forthcoming months a project supported by both the British Council and UK Royal Society. This research will be developed to study (i) lipid layers due to their relevance as a model to study the

initiation reaction of the lipidic peroxidation that takes place in the double layer of the cellular membrane and (ii) DNA-protein complexes since these are vital to understanding DNA damage in the cell.

PROJECTED PUBLICATIONS/ARTICLES RESULTING OR TO RESULT FROM THE GRANT

Two publications are to be submitted shortly

Other publications will emerge during the next months as soon as we compile and analyse the relevant data recorded. We expect 2 – 3 more papers to be submitted to international journals as part of the present grant.

Paulo Lima-Vieira

Lisbon, 21st May 2007.

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

The visit of Paulo Lima-Vieira was accomplished with success and according to the planned activities.

Prof. Nigel John Mason

Milton Keynes, 21st May 2007.