MARIE SKŁODOWSKA-CURIE INDIVIDUAL FELLOWSHIPS 2020

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

FCT NOVA | School of Science and Technology
Research Unit: CEFITEC

RESEARCH GROUP AND URL

Atomic and Molecular Collisions Laboratory
URL: http://lcam.cefitec.fct.unl.pt/

SUPERVISOR (NAME AND E-MAIL)

Paulo Limão-Vieira
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SHORT CV OF THE SUPERVISOR

Full Professor of Molecular Physics; since 2005 appointed visiting professor in Brazil, Japan, UK, Australia and South Korea universities. From 2009–2020, appointed member of the scientific council of School of Science and Technology, UNL, PT; 2008 –2020, elected head of research at Centre of Physics and Technological Research, UNL, PT and since 2004, head of Atomic and Molecular Collisions Laboratory, UNL, PT; 2013–2020 established and coordinates a new international Programme on Radiation Biology and Biophysics Doctoral Training Programme (RABBIT), involving UNL, PT, CSIC (Spanish National Research Council), Spain, Queen's University Belfast, UK, Open University, UK and Universität Innsbruck, Austria. Since 2013, member of the International Atomic Energy Agency International code centre network.
He has over 220 papers (1 Nature Communications) published in international peer review journals, 7 books (1 in Springer-Nature), 8 chapters of books, invited for more than 80 oral contributions (11 plenaries) in international scientific meetings and ca. 300 published contributions in international scientific meetings. H-index 28 and over 2600 citations. He has been the supervisor of 6 Post-Docs, 12 PhDs and 12 MSc students.
Since 2003, head and member of more than 40 research grants on European Integrated Activity on Synchrotron and Free Electron Laser Science; awarded several research grants from the Portuguese National Agency (9), UK Royal Society grant (1) and Spanish Ministry of Economy (2); Head of 6 and member of 2 joint research grants with Belgium, Spain, UK and Brazil; Since 1995, he was awarded over 15 research prize-winner and scholarships, including the 2003 University College London Carey Foster Prize for outstanding research (UK), JSPS Short-term Invitation Fellowship for Research in Japan (2016) and ENDESA Foundation for research in Spain (2019);
In 2019, Elected Chairman of the International Symposium on Electron-Molecule Collisions and Swarms (EMS); Since 2004 he has been acting as a permanent referee to more than 40 international peer review journals, international peer-review books and e-books, international peer review databases and funding agencies (worldwide, e.g. Argentina, Australia, Brazil, Czech Republic, Kazakhstan, Portugal, Qatar, UK, US,); advisory of more than 25 scientific board members and adviser to the Hungarian Academy of Sciences (2012 and 2016); chairman of international scientific meetings; National Delegate and Member to several international scientific and steering committees of EU COST Actions. He keeps close collaboration and scientific exchange with the most

recent: Sophia University, Tokyo, Japan; CSIC, Madrid, Spain; Universität Innsbruck, Austria; University of Aarhus, Denmark, Université de Lille, France; Flinders University, South Australia.
The research activities involve electron spectroscopy through electron-molecule and photon-molecule interactions and the spectroscopic issues related to photon absorption from photon-molecule interactions in several molecular targets. These include decomposition and reaction processes in biological relevant molecules (e.g. DNA/RNA bases and derivatives, sugars, amino acids), gas-phase dissociative electron attachment processes in biological and aeronomical relevant molecules (including plasma processing), with particular attention to environmental issues such as global warming and ozone depletion. Other activities include the effects of radiation damage in the biomolecular environment at the molecular level and negative ion formation by electron transfer processes to biomolecules in atom-molecule collision experiments.

5 SELECTED PUBLICATIONS

- Combined Experimental and Theoretical Studies on Electron Transfer in Potassium Collisions with CCl_4, J. Phys. Chem. A 124 (2020) 3220;
- Electron-transfer induced decomposition in potassium-nitroimidazoles collisions: an experimental and theoretical work, Int. J. Mol. Sci. 151 (2019) 184302;
- Electron Ionization of Imidazole and its Derivative 2-Nitroimidazole, J. Am. Soc. Mass Spectrom. 30 (2019) 2678;
- Low-energy electrons transform the nimorazole molecule into a radiosensitizer, Nat. Commun. 10 (2019) 2388;
- Electron-induced dissociation of the potential radiosensitizer 5-selenocyanato-2'-deoxyuridine, J. Phys. Chem. B 123 (2019) 1274.

PROJECT TITLE AND SHORT DESCRIPTION

Negative ion formation in electron transfer processes to radiosensitizers

The effects of ionising radiation on biological material have been studied on the tissue scale for many years. However, research to understand the processes at a molecular level has begun only recently. Relatively few experiments have been carried out on the effects of ionising radiation and secondary electrons on key biological molecules such as DNA and its constituent bases. Cross-sectional results for these interactions are highly relevant to the use of radiation in medicine. Today, it is possible to isolate biomolecules including uracil, thymine, and adenine (bases of RNA and DNA) in the gas-phase. The current unique research apparatus will be used to study electron transfer by potassium – radiosensitizers collisions. The experiment thus represents a novel perspective spanning two traditionally independent research areas: electron attachment and electron harpooning studies of gas phase molecules. Total partial cross sections will be obtained in an energy range from about a few eV up to several hundreds of eV. These experiments will allow us to probe whether such electron transfer process is a correct model for electron transport in DNA or whether electron harpooning by bound electrons supplied in K - molecule scattering is a more appropriate model for electron transport under physiological conditions.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST

PHY (Physics, Applied Atomic and Molecular Physics)