The 2024 Collisions Physics and Chemistry and their Applications Conference

and

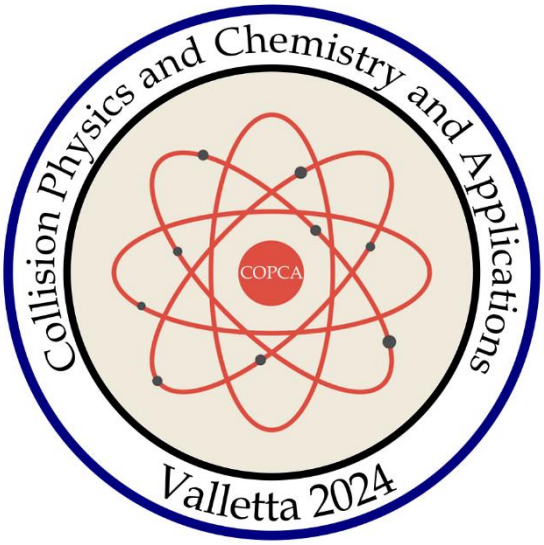
A Workshop of the COST Action 20129:
Multiscale Irradiation and Chemistry Driven Processes and Related Technologies

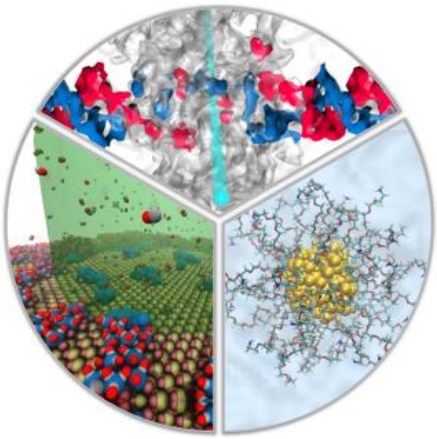
COPCA-MultIChem 2024

15th – 18th October 2024

Aula Magna, University of Malta, Valletta, Malta

ABSTRACT BOOKLET





COST Action CA20129

MultIChem

Multiscale Irradiation and Chemistry Driven Processes and Related Technologies

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CONFERENCE WEBPAGE

The conference webpage may be found at: https://copcaconference.wixsite.com/copca2024

Wednesday, 16th October 2024

Conference Day Two (MultIChem Sessions)

Session 4: **Electron Interactions with Molecules**

Chair: Nigel J. Mason (University of Kent, United Kingdom)

09.00 Electron-Induced Processes in Gas and Liquid Phase Molecules
Pamir Nag (J. Heyrovský Institute of Physical Chemistry, Czechia)

09.30 Electron and Ion Induced Reactions with Thiophenes Studied by MS, IMS-MS, and DFT
Peter Papp (Comenius University Bratislava, Slovakia)

10.00 Electron-Induced Decomposition of Nucleobase Derivatives by Dissociative Electron Attachment Processes
Janina Kopyra (University of Siedlce, Poland)

10.30 Electron Collision-Induced Reactions in Isolated and Clustered Interstellar Molecules
Sam Eden (Open University, United Kingdom)

11.00 **Coffee Break**

11.30 Emission Spectroscopy of Electron-Molecule Collisions
Juraj Országh (Comenius University Bratislava, Slovakia)

12.00 Electron-Induced Fragmentation of Biologically Relevant Molecules in the Gas Phase
Stephan Denifl (University of Innsbruck, Austria)

12.30 Electron-Molecule Collisions in the Gas Phase
Jelena Maljković (Institute of Physics Belgrade, Serbia)

13.00 Experimental and Theoretical Momentum Distributions of Molecules with Astrochemical Relevance
Kate Nixon (Open University, United Kingdom)

13.30 **Lunch Break**

Session 5: **Radiation Science with Applications to Biology and Health Sciences**

Chair: Pamir Nag (J. Heyrovský Institute of Physical Chemistry, Czechia)

14.30 Radiation Damage to DNA Nanostructures: From Fundamentals to Applications
Jaroslav Kočišek (J. Heyrovský Institute of Physical Chemistry, Czechia)

Electron Molecule Interaction in the Gas Phase

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Synopsis. We have undertaken a collaborative study combining theoretical and experimental approaches to investigate elastic electron scattering from halotahane, sevoflurane, isoflurane and desflurane, considering the environmental impact of these halogenated compounds. In our experimental work, elastic differential cross sections (DCS) were measured at an electron energy range from 50 eV-300 eV. using a crossed-beam apparatus equipped with an electron gun, a capillary gas needle, and a channeltron detection system. Theoretical calculations were performed using the Independent Atom Model with the Screening Corrected Additivity Rule (IAM-SCAR+I), incorporating interference effects. .

Considering the growing interest for the environmental impact of anesthetic molecules on both global warming and ozone layer depletion, we have undertaken a collaborative study combining theoretical and experimental approaches to investigate elastic electron scattering from halothane, sevoflurane, isoflurane, and desflurane. These anesthetic gases, commonly excreted unchanged into the atmosphere after use [1], contribute to rising global concentrations of halogenated compounds, which possess high Global Warming Potentials (GWP) and significant Ozone Depletion Potentials (ODP).

Crossed electron-molecular beam apparatus UGRA was used for measuring absolute differential cross sections for elastic electron scattering on aneastehetic molecules. The experimental set-up consists of an electron gun (hairpin electron source, up to about 1 μA incident beam current in the energy range from 50-300 eV) a double cylindrical mirror energy analyzer (DCMA) and a channel electron multiplier as a detector [2]. The experiment is performed in crossed beam setting. Relative differential cross section (DCS) is normalized on the absolute scale using the relative flow method, with Ar as a reference gas. The theory is obtained with IAM+SCAR method (Independent Atom Model + Screening Corrected Additivity Rule). Experiment and theory are generally in very good agreement, considering absolute scale and shape.

Acknowledgements. This research was supported by the Science Fund of the Republic of Serbia, Grant No. 6821, Project title – ATMOLCOL and CA 20129 MultIChem.

References

1.Y. Shiraishi, et al. (1990). *Journal of Clin. Anesth*, **2**, 381.

2. J. B. Maljković et al. (2023). *Eur. Phys.J. Plus*, **138**, 349.