ISSN 2637-3298

XV INTERNATIONAL CONFERENCE ON SOCIAL AND TECHNOLOGICAL DEVELOPMENT – STED 2026

THE BOOK OF ABSTRACTS

XV MEĐUNARODNA KONFERENCIJA O DRUŠTVENOM I TEHNOLOŠKOM RAZVOJU–STED 2026

ZBORNIK IZVODA RADOVA

Trebinje, June, 04-07, 2026.
Trebinje, 04-07. juni 2026. godine

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Publisher:
University PIM, Banja Luka, Republic of Srpska, B&H

For publisher
Dejan Kojić, PhD, General Manager

Editors:
Dejan Kojić, PhD
Darjana Sredić, PhD

Design and Computer processing:
Ljubica Janjetović, PhD

Print:
„Vilux“ Banja Luka

Circulation:
120 copies

EJECTED ELECTRON SPECTRA FROM INHALATION ANESTHETIC MOLECULE N_2O

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ABSTRACT

Nitrous oxide (N_2O) has important uses in medicine as inhalation anesthetic molecule, industry and major environmental impact. N_2O, whose life is about 116 ± 9 years (Feng and Li, 2023) has beenthe predominant ozone-depleting substance throughout this century. Reportedly, in terms of ozone-depleting potentials (ODP), in 2020, the ODP-weighted anthropogenic N_2O emissions were more than two times that of all chlorofluorocarbons (CFCs). It strongly influences the troposphere heat budget, in particular, the increase of its anthropogenic emissions is leading to a significant increase of the Earth's surface temperature. In fact, long average atmospheric residence time (about 116 years), currently, makes it the third most important long-lived greenhouse gas after carbon dioxide and methane. For all this reasons the spectra of ejected electrons of N_2O in the region 3-24 eV have been investigated by using Omicron High Resolution Hemispherical Analyzer (OHRHA) at different incident energies from 100 eV down to 30 eV eV and two scattering angles (40º and 90º). Details of the experimental setup and procedures can be found in (Jureta et al., 2026). In the present experiment a non-monochromatic electron beam in the energy range (30 – 100) eV (±0.4 eV) collides with an molecular beam effusing in the perpendicular direction to the scattering plane from a platinum-iridium non-biased needle with internal diameter of 0.5 mm. The interaction region has a cylindrical form (50 mm diameter) made by the two cylinders of thin μ-metal foils separated by10 mm in the collision plane in order to avoid scattering of electrons from metal surfaces. The ejected electrons are detected by a high-resolution hemispherical analyzer with a mean radius of 125 mm equipped with seven channeltrons. The analyzer operates at pass energy of 1 eV with defined retarding ratio and defined magnification determined by a two stage 11 elements lens system. The spectra are obtained in the Constant Analyzer Energy (CAE) mode in which the analyzer pass energy was constant, while the kinetic energy was scanned by varying the retarding ratio of the lens stack. The background pressure in the vacuum chamber was ~10^{-8} mbar, while the working pressure with N_2O gas in was ~10^{-6}.

Keywords: anesthetic molecules, ejected electron spectra.

Acknowledgments

This research was supported by the Science Fund of the Republic Serbia, Grant No. 6821, ATMOLCOL.

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A COMPARATIVE STUDY OF DIFFERENTIAL CROSS SECTIONS FOR ELASTIC ELECTRON SCATTERING FROM INHALATION HALOGENATED ANESTHETICS AT 150 EV

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ABSTRACT

Inhalation halogenated anesthetics are of increasing environmental concern due to their high global warming potentials (GWPs), making the study of their interaction with low-energy electrons relevant for atmospheric processes. In this work, we report experimental differential cross sections (DCSs) for elastic electron scattering from three widely used anesthetics—sevoflurane, desflurane, and isoflurane. The measurements were performed using a crossed-beam setup under single-collision gas-phase conditions. The obtained angular distributions exhibit features related to molecular size, structure, and degree of halogenation. A comparative analysis reveals both similarities and notable differences among the molecules, indicating the influence of molecular geometry on scattering dynamics. The experimental results show overall good agreement with IAM-SCAR+I theoretical predictions, providing insight into interference and screening effects in electron–molecule scattering. These results contribute to the validation of theoretical models for complex molecular systems and improve the understanding of the environmental impact of inhalation halogenated anesthetics.

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

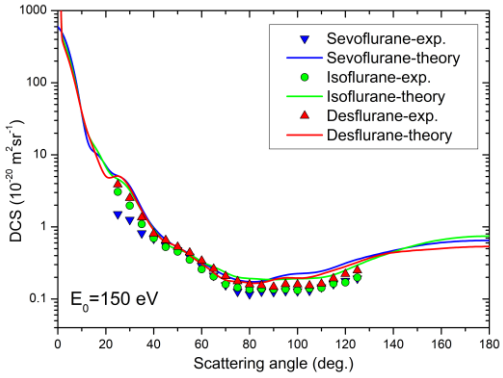

Figure 1 DCS for elastic electron scattering from sevoflurane, isoflurane and desflurane for 150eV incident electron energy.

Keywords: Anesthetics, electron scattering, cross section, global warming potential.