



5th Conference on Elementary Processes in Atomic Systems

Belgrade, Serbia, June 21 - 25, 2011



CEPAS 2011 & CEAMPP 2011

CONTRIBUTED PAPERS
&
ABSTRACTS OF INVITED LECTURES

Editors

Aleksandar R. Milosavljević

Saša Dujko

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IPB Institute of Physics
Belgrade - Serbia

2nd National Conference on Electronic,
Atomic, Molecular and Photonic Physics





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Abstracts and Contributed Papers

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Institute of Physics
Belgrade, Serbia

Belgrade, 2011

CONTRIBUTED PAPERS & ABSTRACTS OF INVITED LECTURES
of the
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and the satellite meeting
2nd NATIONAL CONFERENCE ON ELECTRONIC, ATOMIC,
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Belgrade, Serbia

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Aleksandar R. Milosavljević, Saša Dujko and Bratislav P. Marinković

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PREFACE

This book contains the Contributed papers and abstracts of the Invited lectures to be presented at the 5st Conference on Elementary Processes in Atomic Systems – CEPAS 2011 and 2nd National Conference on Electronic, Atomic, Molecular and Photonic Physics – CEAMPP 2011.

The Conference on Elementary Processes in Atomic Systems (CEPAS) is held triennially to promote the growth and exchange of scientific information in the field of photo-processes and laser collisions, electron (positron)/atom collisions, collisions with biomolecules, heavy particles (ion/atom) collisions, interactions with surfaces and processes with nano-sized complex systems. The first conference in the CEPAS series was organized in Uzhorod (Ukraine, 2000), the second one in Gdańsk (Poland, 2002), the third in Miskolc (Hungary, 2005), the forth in Cluj-Napoha (Romania, 2008) and the present fifth in Belgrade (Serbia, 2011). In all of these places, scientific research has been well established in particular fields that highlight the conference topics but the given opportunity to organize the CEPAS conference leads to further promotion of science and local research groups, thus receiving the full international recognition. The scientific program of the CEPAS 2011 consists of sessions of invited plenary (30 min) and topical (25 min) lectures. Contributed papers are presented as posters in afternoon sessions.

The National Conference on Electronic, Atomic, Molecular and Photonic Physics - CEAMPP is now a traditional national conference covering a wide range of scientific topics in atomic and molecular physics. The CEAMPP aims to bring together and support collaboration between different groups working basically in various fields of atomic and molecular physics, so to induce new ideas and interdisciplinary research. The focus of the CEAMPP is placed upon the young and distinguished researchers, who will be invited to give the most of the lectures at the conference. Still, the CEAMPP aims to preserve a high scientific level with the goal of presenting the frontier results both in Serbia and worldwide.

We are grateful for the support to Ministry of Education and Science of Republic of Serbia, Embassy of France in Belgrade, Embassy of Austria in Belgrade, Framework programme 7 project "Virtual Atomic and Molecular Data Centre" - VAMDC, Springer's journal "European Physical Journal D: Atomic, Molecular, Optical and Plasma Physics". We also acknowledge the support of Serbian Academy of Science and Arts and Institute of Physics, University of Belgrade. Finally, we are also grateful to Astra travel agency for technical organization of the conference.

The Editors would like to thank the members of the International Advisory Board of CEPAS 2011 and Scientific Committee of CEAMPP 2011 for their efforts in proposing the program of the conference, as well as plenary and topical invited lectures. Finally, we acknowledge the support of all members of the Organizing Committee who contributed to the preparing and running of the conference.

The participants have been asked to send their papers in a format already prepared for publication. After peer review of contributions, the basic corrections have

been made to meet general form of the book and to avoid, as much as possible, typing, spelling and grammatical errors. The Editors apologize for all mistakes that emerged from the preparation process and software problems in the process of printing.

Finally we would like to thank all the invited speakers and the participants for taking part in CEPAS 2011 and CEAMPP 2011 and to wish them to have a pleasant stay in Belgrade.

Belgrade, June, 2011

Editors

ACKNOWLEDGEMENT

5th CONFERENCE ON ELEMENTARY PROCESSES IN
ATOMIC SYSTEMS
&
2nd NATIONAL CONFERENCE ON ELECTRONIC, ATOMIC,
MOLECULAR AND PHOTONIC PHYSICS

are organized by the

**Institute of Physics
Belgrade, Serbia**

in collaboration with the

Serbian Academy of Sciences and Arts

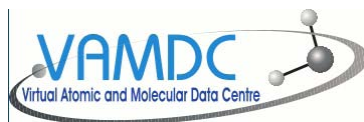
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Ambassade de France en Serbie*



CONFERENCE TOPICS

CEPAS 2011

1. Photo-processes and laser collisions
2. Electron(positron)/atom collisions
3. Collisions with biomolecules
4. Heavy particles (ion/atom) collisions
5. Interactions with surfaces
6. Processes with nano-sized complex systems

CEAMPP 2011

1. Atomic and Molecular Structure and Properties
2. Collision Processes
3. Photon Interaction with Atoms and Molecules

CEPAS 2011

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CEAMPP/ CEPAS 2011 PROGRAM

Tuesday 21st June 2011		
2nd National Conference on Electronic, Atomic, Molecular and Photonic Physics - CEAMPP		
<i>(PL – Plenary lecture: 25+5 min; PR – Progress report: 15+5 min)</i>		
08:00-09:15	Registration (CEAMPP)	
09:15-09:30	Opening (CEAMPP), Chair: Saša Dujko	
	Plenary Session , Chair: Aleksandar Milosavljević	
09:30-10:00	<i>Dynamics of dissociative electron attachment to small molecules</i>	Juraj Fedor , University of Fribourg, Switzerland
10:00-10:30	<i>Soft X-ray spectroscopy of molecules and biomolecules</i>	Christoph Nicolas , SOLEIL Synchrotron, Saint-Aubin, France
10:30-11:00	<i>Grazing incidence fast atom diffraction on different materials</i>	Nenad Bundaleski , CEFITEC, Caparica, Portugal
11:00-11:30	Coffee break	
	Session 2 , Chair: Saša Dujko	
11:30-11:50	<i>On the propagation of positive streamers in N₂:O₂ mixtures</i>	Gideon Wormeester , CWI, Amsterdam, The Netherlands
11:50-12:10	<i>Numerical modeling of buffer gas positron traps</i>	Srđan Marjanović , Institute of Physics, Belgrade, Serbia
12:10-12:30	<i>Absolute cross sections for electron scattering from metal vapours</i>	Sanja Tošić , Institute of Physics, Belgrade, Serbia
12:30-12:50	<i>Excitation of molecules by low-energy electrons</i>	Miroslav Ristić , Faculty of Physics, Belgrade, Serbia
13:00-15:00	Lunch break	
	Session 3 , Chair: Nenad Simonović	
15:00-15:20	<i>Ab initio calculation of low-lying vibronic levels in the ground $X^2\Pi_u$ electronic state of dicyanoacetylene cation</i>	Radomir Ranković , Faculty of Physical Chemistry, Belgrade, Serbia
15:20-15:40	<i>Theoretical study of the Jahn-Teller effect</i>	Maja Gruden Pavlović , Faculty of Chemistry, Belgrade, Serbia
15:40-16:00	<i>Coherent effects in laser driven rubidium vapor</i>	Milan Radonjić , Institute of Physics, Belgrade, Serbia
16:00-16:20	<i>Monte Carlo modeling of Townsend discharges in hydrogen</i>	Vladimir Stojanović , Institute of Physics, Belgrade, Serbia
16:20-16:40	Coffee break	

16:45-18:00	Poster session (CEAMPP)	
18:00-19:00	Registration (CEPAS)	
19:00	Welcome party for CEAMPP and CEPAS participants	
Wednesday 22 nd June 2011		
5 th Conference on Elementary Processes in Atomic Systems - CEPAS		
(PL – Plenary lecture: 30+5 min; TL – Topical lecture: 20+5 min)		
08:00-08:45	Registration (CEPAS)	
08:45-09:00	Opening (CEPAS), Chair: Bratislav P. Marinković	
	Plenary Session, Chair: Zoran Lj. Petrović	
09:00-09:35	Positronium negative ion experiments	Yasuyuki Nagashima, Tokyo University of Science, Japan
09:35-10:10	Imaging electron/ion coincidences for gas phase photoionization studies of chiral systems on the DESIRS beamline at SOLEIL	Laurent Nahon, SOLEIL synchrotron, France
10:10-10:40	Coffee break	
	Session 2, Chair: Nigel Mason	
10:40-11:05	Cross sections for elastic electron scattering from iodine	Michael Brunger, Flinders University, Australia
11:05-11:30	Quantum interferences in atomic ionization by short laser pulses	Diego Arbó, Astronomia y Física del Espacio, Buenos Aires , Argentina
11:30-11:55	Electron driven processes in biomolecules	Janina Kopyra, University of Podlasie, Poland
11:55-12:20	Multi- photon ionization of biomolecular clusters	Sam Eden, The Open University, UK
12:30-15:00	Lunch break	
	Session 3, Chair: Robert DuBois	
15:00-15:25	Coherent wavepacket shaping in high Rydberg states	Shuhei Yoshida, Vienna University of Technology, Austria
15:25-15:50	Positron scattering from krypton	James Sullivan, Australian National University, Australia
15:50-16:15	Absolute differential cross sections for electron scattering from building blocks of biopolymers	Aleksandar Milosavljević, Institute of Physics Belgrade, Serbia
16:15-16:35	Coffee break	

	Session 4, Chair: Viorica Stancalie	
16:35-17:00	<i>Differential cross sections of some noble atoms studied by fast electron impact and inelastic x-ray scattering</i>	Lin-Fan Zhu, Hefei National Laboratory for Physical Sciences at Microscale, China
17:00-17:25	<i>The effect of temperature on guiding of slow highly charged ions through mesoscopic glass capillaries</i>	Réka Bereczky, ATOMKI, Debrecen, Hungary
17:30-19:00	Poster session (1)	
Thursday 23rd June 2011		
	Plenary Session, Chair: Bratislav P. Marinković	
09:00-09:35	<i>Effect of projectile coherence on atomic fragmentation processes</i>	Michael Schulz, Missouri University of Science and Technology, USA
09:35-10:10	<i>Collisions with biomolecules: negative ion formation</i>	Paulo Limão-Vieira, Universidade Nova de Lisboa, Portugal
10:10-10:40	Coffee break	
	Session 2, Chair: Paulo Limão-Vieira	
10:40-11:05	<i>Hard X-ray polarimetry in energetic ion-atom collisions</i>	Günter Weber, Helmholtz Institute Jena, Germany
11:05-11:30	<i>Photoionization study of trapped biopolymer ions in the gas phase</i>	Alexandre Giuliani, SOLEIL synchrotron, France
11:30-11:55	<i>Spatially resolved transport properties for electrons in gases: Definition, interpretation, and calculation</i>	Saša Dujko, Institute of Physics Belgrade, Serbia
11:55-12:20	<i>Excitation reactions studied by electron induced fluorescence method</i>	Juraj Országh, Comenius University Bratislava, Slovakia
12:30-15:00	Lunch break	
	Session 3, Chair: Károly Tőkési	
15:00-15:25	<i>On deviations from theory of electron-atom elastic scattering cross sections</i>	Raymond Moreh, Ben-Gurion University of the Negev, Israel
15:25-15:50	<i>Photofragmentation of organic molecules of biological interest</i>	Paola Bolognesi, CNR-IMIP, Italy
15:50-16:15	<i>Electron-impact and thermal fragmentation of the amino acid molecules: mechanisms and structure of the molecules</i>	Alexander Snegursky, Institute of Electron Physics Uzhgorod, Ukraine
16:15-16:40	<i>Nanostructures formed on various surfaces due to the impact of individual slow highly charged ions</i>	Robert Ritter, Vienna University of Technology, Austria
16:40-17:00	Coffee break	

17:00-18:30	CEPAS Advisory Board meeting	
19:30	<i>Concert</i>	
Friday 24th June 2011		
	Plenary Session, Chair: Friedrich Aumayr	
09:00-09:35	<i>Inelastic transitions of atoms (and molecules) induced by van der Waals interaction with a surface</i>	Jacques Baudon , University Paris 13, France
09:35-10:10	<i>Ions Colliding with Cold Polycyclic Aromatic Hydrocarbon Clusters</i>	Patrick Rousseau , CIMAP Caen, France
10:10-10:40	Coffee break	
	Session 2, Chair: Jiří Horáček	
10:40-11:05	<i>Laser Raman scattering from biomolecules in nanoparticles-embedded tissue</i>	Simona Cintă Pinzaru , Babes-Bolyai University, Romania
11:05-11:30	<i>Scattering from biomolecules in helium droplets</i>	Stefan Denifl , University of Innsbruck, Austria
11:30-11:55	<i>Channeling of charged particles through carbon nanotubes</i>	Duško Borka , Vinča Institute of Nuclear Sciences, Serbia
11:55-12:20	<i>Resonant inelastic collisions of electrons with diatomic molecules</i>	Karel Houfek , Institute for Theoretical Physics Prague, Czech Republic
12:30-15:00	Lunch break	
	Closing session, Chair: Andrey Solov'yov	
15:00-15:35	<i>Classical theory of atomic collisions – the first hundred years</i>	Petar Grujić , Institute of Physics Belgrade, Serbia
15:35-16:00	<i>Thermo-mechanical impact on biomolecules induced by heavy ions</i>	Alexander V. Yakubovich , Frankfurt Institute for Adv. Studies, Germany
16:00-16:25	<i>Ion Interactions with Graphene</i>	Zoran Mišković , University of Waterloo, Canada
16:30-16:50	Coffee break	
16:50-18:20	Poster session (2)	
20:00	<i>Conference dinner</i>	
Saturday 25th June 2011		
10:00	Excursion	

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**5th Conference on Elementary Processes in
Atomic Systems**

POSTER CONTRIBUTIONS

Time resolved laser induced fluorescence measurements: considerations when using Nd:YAG based system

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Time-resolved laser-induced fluorescence (TR-LIF) and the laser induced breakdown spectroscopy (LIBS) have been shown to be methods which are fast and sensitive to provide information about the constituents in analyzed samples. TR-LIF and LIBS have similar hardware requirements. In this paper we analyze some characteristics of TR-LIF/LIBS system implemented in our laboratory [1], [2], [3], shown in Fig. 1, considering the fact that the excitation part of the system is based on Nd:YAG laser and Optical Parametric Oscillator (OPO). The laser is more than powerful enough (365 mJ at 1064 nm, variable OPO output >5mJ) for LIBS, but somehow slow (the length of fundamental laser harmonic output pulse is about 5 ns) for fluorescence measurements in our present area of interest, namely plants and food products. The pulse length of tunable OPO output (320-475 nm) could be reduced to shorter times, so by means of a correct deconvolution procedure it is possible to measure the fluorescence lifetimes in the range as small as a few nanoseconds. The fluorescence detection part of our system is based on picosecond streak camera. Using the fluorescent dyes (Rhodamine B and Fluorescein) ethanol solutions we verified the analyzing capabilities of our TR-LIF system.

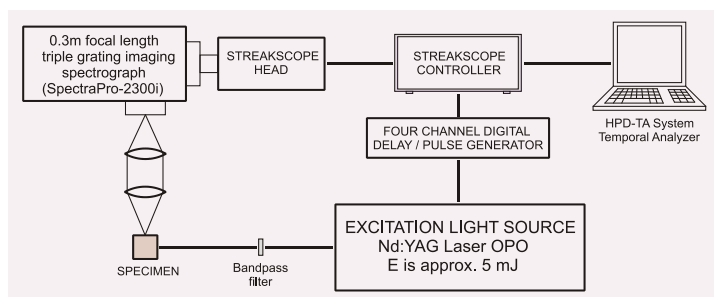


Fig. 1. Schematic illustration of experimental setup for TR-LIF spectroscopy

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Detecting indium spectral lines using electron spectroscopy and laser induced breakdown spectroscopy

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In this paper we present results regarding indium lines obtained by electron spectroscopy and laser induced breakdown spectroscopy. The resolution of our laser induced breakdown spectroscopy (LIBS) apparatus is better than when using electron spectroscopy. However, possibility of detection of optically forbidden transitions is an advantage of electron spectroscopy. The results that concern the elastic differential cross sections and resonant excitations of indium atoms are obtained using the electron spectroscopy in our laboratory and published recently [1,2]. An advantage of LIBS is the possibility of operation under normal temperature and air pressure. The optical diagnostics of indium lines could be useful for detecting indium in electric waste, because the detecting device could be made portable. Some preliminary results of detecting indium are presented in [3]. The most intense lines of the spectrum at 304 nm, 325 nm, 410 nm, 452 nm are detectable by both methods. Time resolved LIBS spectrum of pure indium is shown in Fig. 1.

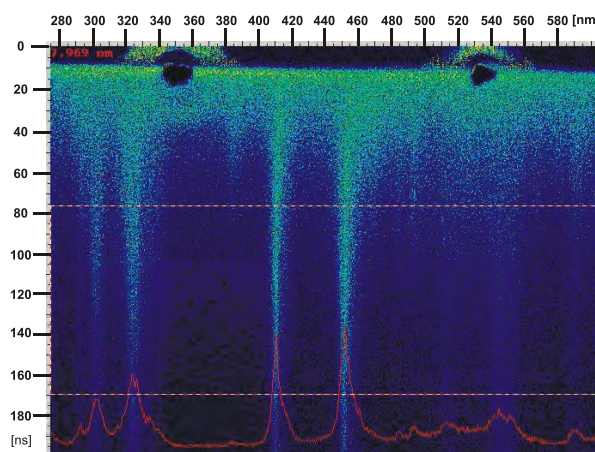


Fig. 1. Time resolved LIBS spectrum of indium.

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Elastic electron scattering from formamide molecule

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In the present contribution, both experimental and theoretical results on elastic electron interaction with formamide molecule are reported. Measurements were performed using a cross beam technique [1], for scattering angles from 20° to 110° and for the incident energies from 50 to 300 eV. The calculations of molecular cross sections are based on a corrected form of the independent-atom method, known as the SCAR (Screen Corrected Additivity Rule) procedure [2]. Regarding the shape of differential cross sections, experimental and theoretical results agree well.

The formamide molecule represents the smallest system containing the peptide bond. Therefore, the investigation on electron interaction with formamide can be useful to understand processes of low-energy electron-protein interactions, as well as for interstellar research [3].

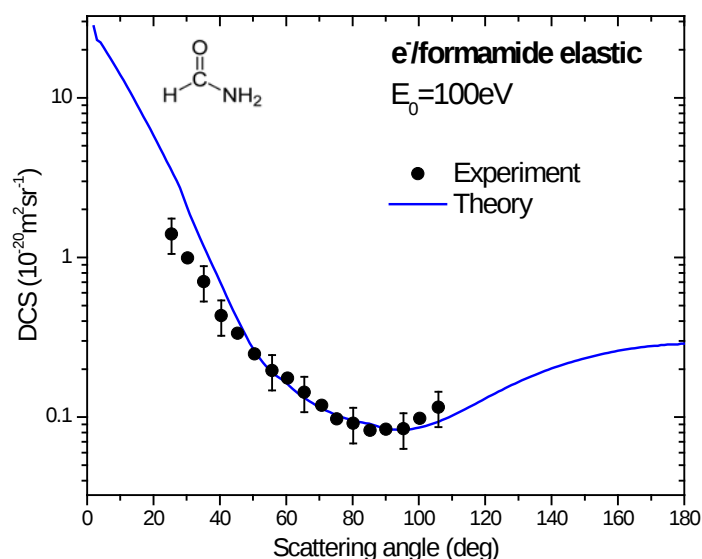


Fig.1. Angular dependence of relative DCSs for elastic electron scattering from formamide molecule at electron energy of 100eV: (—), theory; (●), experiment (normalized to the theory).

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Establishing a dynamical equilibrium in electron transmission through insulating microcapillaries

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We study the time dependence of electron transmission through microscopic (length 15 μm , diameter 270 nm) Al_2O_3 capillaries [1]. As in the case of ion transmission dynamical equilibrium is reached after some time [2]. Here, however, transmission sets in “immediately” (detection limit corresponds to about 50 nC deposition of charge) and reduces to its equilibrium value while for ions the charge-up time is required to build a charge patch in the entrance area of the capillary which deflects ions along the capillary axis.

We interpret this behavior based on a microscopic study of the process [3] in which the complete electron-insulator interactions sequence is taken into account. As electrons cannot change their initial charge state, charging of the surface can occur only if either the electron enters the target and is captured there (negative charge-up) or if interactions between the energetic primary electron and electrons in the valence band of the target lead to the emission of low-energy secondaries (positive charge-up). In the latter case, electrons are attracted to the surface rather than being deflected by Coulomb forces. This will lead on the one hand to a reduction of electron transmission as a function of time; on the other hand, however, (local) positive charging will enlarge the surface barrier and reduce the amount of low-energy electrons emitted. Eventually, a dynamical equilibrium will be established.

Indeed, this behavior is found in our experiments (see Fig. 1b) indicating a secondary-electron emission yield $\gamma > 1$ which is also corroborated by independent experimental data [4] and the large fraction of low-energy electrons exiting the capillary target (Fig. 1a).

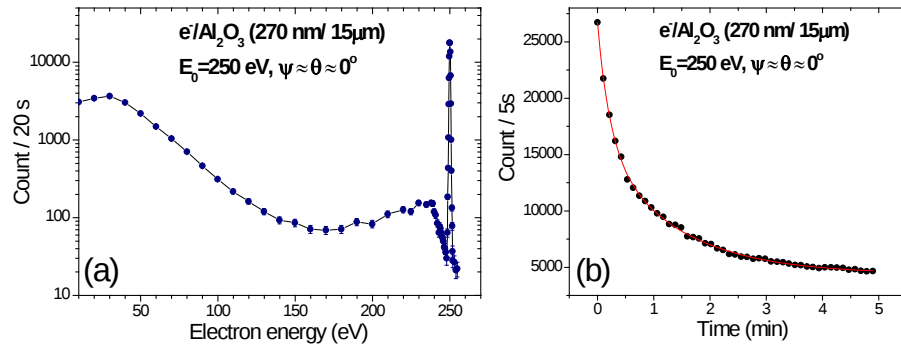


Fig.1. Electron transmission through an insulating Al_2O_3 capillary as a function of energy (a) and time (b). Secondary (low-energy) electron emission leads to local charge-up of the inner capillary wall reducing the transmission rate.

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