



20th ESCAMPIG



**Program of the
20th European Conference on the Atomic
and Molecular Physics of Ionized Gases**

13 – 17 July 2010, Novi Sad, Serbia

Organized by: Institute of Physics, Belgrade, Serbia



<http://www.escampig2010.ipb.ac.rs>

- 1.60 Stefan Tinck, Annemie Bogaerts, Werner Boullart
Modeling Ar/Cl₂/O₂ and Ar/SiH₄/O₂ Inductively Coupled Plasmas used for anisotropic etching of silicon and deposition of SiO_x
- 1.61 Branko Tomcik, Thomas Osipowicz
Nanolaminated advanced carbon overcoat study by Rutherford backscattering spectroscopy and Monte Carlo ion beam simulation of film growth

9. LOW PRESSURE PLASMA SOURCES

- 3.21 Norihiko Sasaki, Yutaka Uchida, Mitsuharu Nogaku
Characteristics of Power Dissipation in Neon DC Glow Discharge Positive Columns

11. PLASMAS AND GAS FLOWS

- 1.64 J. Annaloro, A. Bultel, P. Omary
Dissociation of CO₂: application to atmospheric Martian entries
- 1.65 Nikolay G. Korobeishchikov: Alexandr E. Zarvin: Valeriy V. Kalyada
Discharge-activated supersonic pulsed gas jet
- 1.66 Mario Merino-Martinez, Eduardo Ahedo
2D plasma flow in Magnetic Nozzles for Propulsion and Processing applications
- 1.67 Aleksandr Rakitin, Andrei Starikovskii
Application of nonequilibrium nanosecond discharge for detonation initiation through a gradient mechanism

WORKSHOP: ATOMIC AND MOLECULAR COLLISION DATA FOR PLASMA MODELING

- 1.68 Bratislav P. Marinkovic, Vladimir I. Kelemen, Vladimir Pejcev, Dragutin Sevic, Milos Krunic, Branko A. Petrusovski, Evgenij Yu. Remeta and Dusan M. Filipovic
Experimental and theoretical study of differential cross sections for elastic electron scattering by Sb atom





XX European Conference on Atomic and Molecular Physics

13 - 17 July 2010



General information

The 20th European Conference on the Atomic and Molecular Physics of Ionized Gases (ESCAMPIG XX) is organized by the [Institute of Physics](#), Belgrade, Serbia. The conference will take place in Novi Sad, Serbia, on July 13-17, 2010, beginning with a welcome reception on Tuesday evening, July the 13th and ending with a workshop on Saturday afternoon, July the 17th.

The ESCAMPIG conference focuses on topics that range from atomic and molecular processes in plasmas and plasma-surface interaction to self-organization in plasmas or to the new research lines with low and high pressure plasma sources. Research in natural plasmas such as space plasmas and the emerging research field of discharge plasmas in the Earth upper atmosphere are also covered.

The International Scientific Committee and the Local Organizing Committee (LOC) invite you to attend the conference and to submit an abstract on your latest scientific achievements.

ESCAMPIG 2014

The ESCAMPIG International Scientific Committee is seeking offers to organize ESCAMPIG 2014. If you are interested in hosting that conference please contact the ISC Chair [Bill Graham](#) before the start ESCAMPIG 2010.

Conference Format

The Conference will feature invited general (45 min, including discussion) and topical lectures (30 min, including discussion), poster sessions and two workshops (with one workshop being extended after the end of the conference). Some contributed papers covering relevant issues will be selected by the ISC for the section "Hot Topics" and authors will be asked to give a short oral presentation (15 min including discussion). Contributors wishing to evidence their own paper for "Hot Topics" selection are asked to indicate it in the abstract submission form. There will be no parallel sessions.

"William Crookes" prize is to be awarded to a mid-career researcher who has been judged to have made major contributions in one or more of the areas covered by ESCAMPIG. The prize is co-sponsored by the ESCAMPIG 2010 local committee, the European Physical Society (EPS) and Plasma Sources Science and Technology. The award will be € 1,000 and a diploma along with hotel accommodation and waived fees to attend ESCAMPIG 2010 where the award will be presented. The nomination package should be sent by email to the Chair of the International Scientific Committee W. G. Graham (b.graham@qub.ac.uk) by March the 1st 2010. More information is available [here](#).

Workshops

Two workshops will be organised during ESCAMPIG 2010 and one post conference workshop on Saturday afternoon. The first will deal with atomic and molecular data required to model collisional plasmas and their interaction with surfaces (N. Mason and Z.Lj. Petrovi•). The second will be focused on biological and medical applications of ionized gases (G. Fridman and N. Pua•) and the post conference workshop (N. Mason) will deal with Atomic and Molecular data needs for lighting. More information about workshops is available [here](#).

Last updated on August 5, 2010

• Conference Info

- [Home](#)
- [Committees](#)
- [Scientific Program](#)
- [Workshops](#)
- [W Crookes' Prize](#)
- [Registration&Fees](#)
- [Paper Submission](#)
- [Deadlines](#)
- [Announcements](#)
- [News](#)

• Location

- [Venue](#)
- [Accommodation](#)
- [Airport transfer](#)
- [Travel Directions](#)

• Miscellaneous

- [Social Events](#)
- [Sponsors](#)
- [Exhibitors](#)
- [Photo Gallery](#)

• Contact

- [LOC](#)
- [Management Office](#)

EXPERIMENTAL AND THEORETICAL STUDY OF DIFFERENTIAL CROSS SECTIONS FOR ELASTIC ELECTRON SCATTERING BY Sb ATOM

B. P. Marinković^{(1,2,*), V. I. Kelemen}^{(3), V. Pejčev}^{(1), D. Šević}^{(1,2), M. Krunic}^{(2), B. A. Petruševski}^{(2), E. Yu. Remeta}^{(3) and D. M. Filipović}⁽¹⁾

⁽¹⁾ Institute of Physics, Pregrevica 118, 11080 Belgrade, Serbia

⁽²⁾ Advanced School for Electrical Engineering and Computing, 11000 Belgrade, Serbia

⁽³⁾ Institute of Electron Physics, 21 Universitetska str., Uzhgorod, 88017 Ukraine

(*) **r t r n c c r**

Differential cross sections (DCSs) for elastic electron scattering by antimony atom have been measured and calculated for the intermediate impact electron energy range from 10 to 100 eV. The effusive beam of Sb atoms is produced by ohmically heated crucible at temperature of 880 K that corresponds to vapour pressure of 13 Pa. It is perpendicularly crossed by monochromatic electron beam while the elastically scattered electrons are detected from 10° to 150°. At the particular impact energy, angular distributions are recorded for several times (3 – 10) and weighted mean was determined. These angular distributions are multiplied by effective path-length correction factors in order to obtain relative DCSs. Angular resolution of the spectrometer has been estimated to be 1.5°. Overall energy resolution of the obtained spectra is 120 meV. The experimental method and electron spectrometer are reviewed elsewhere [1].

The theoretical results are obtained in terms of a model of phenomenological complex optical potential with allowance for spin-orbit interaction (*SE So*-approximation). The calculation without of absorption (*SE So*-approximation) is carried out using a parameter-free real potential. Total and some subshells electron densities in Sb atom and static potential are calculated within the framework of the local relativistic approximation of the density functional theory [2] and for them analytical expressions have been obtained. We use the local exchange potential in the free electron gas approximation [2], the parameter-free correlation-polarization potential [3], the spin-orbit potential [4] and the McCarthy-type absorption potential with empirical parameter [5].

In Fig. 1 differential cross sections for elastic electron scattering by antimony atom are presented. Both types of calculations are shown: *SE So* approximation with absorption potential and *SE So* approximation with only real part of potential (without absorption). Experimental values are normalized at 60° on the *SE So* curve. Statistical error bars are within the size of the symbols. The overall very good agreement between experimental and calculated shapes of elastic DCSs can be noticed. However, some details of discrepancy exist. At small scattering angles, experimental curve is more forward peaked than both calculations. The exact positions of minima in DCS could not be tested by the experiment since the chosen discrete points are separated by 10 degrees. The positions of the first minimum are at 37° and 41°; and for the second minimum at 87° and 88.5° in the *SE So* and *SE So* approximations respectively. Both approximations give the position of the third minimum at 143°. Also, while the span of values between maximum at about 60° and minima at about 40° and 90° are the same for measured and calculated values. The same holds for the case of the second maximum (120°) and third minimum here this ratio is approximately 25. Absorption effects are especially important at larger scattering angles [6] but

the angular range above 150° is inaccessible for the experiment in the present arrangement of the electron spectrometer.

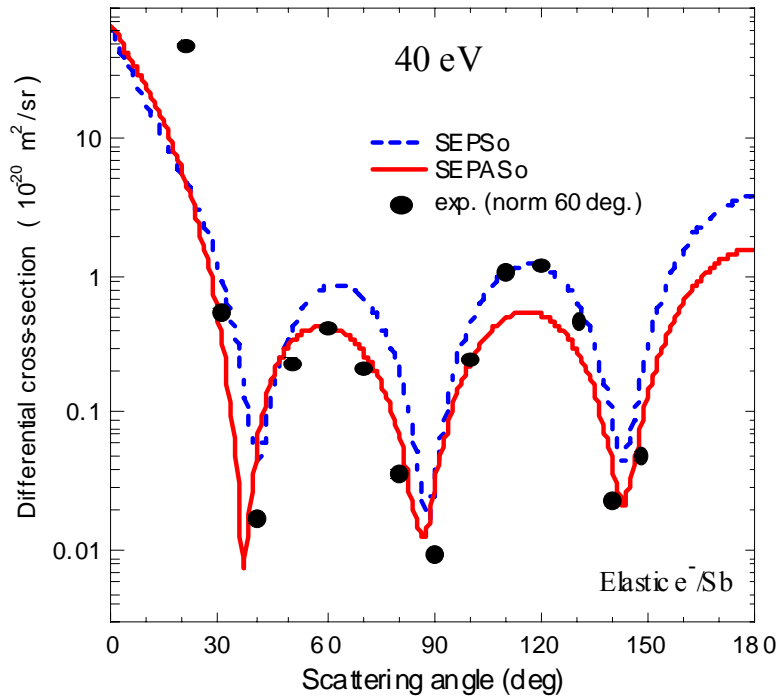


Fig. 1: Differential cross sections for elastic electron scattering by antimony atom at 40 eV impact energy. Experiment: \bullet . Theory: $---$, SE S0; $---$, SE PA S0. Experimental values are normalized at 60° on SE S0 curve.

Similar comparison could be drawn for the other impact energies and it will be communicated at the conference.

conclusion

This work has been partly supported by the MSTD of the Republic of Serbia under project grant No. 141011, and ESF COST Action MP1002 Nano-IBCT and RADAM.

Reference

- [1] B. P. Marinković, V. Pejčev, D. M. Filipović, D. Šević, S. Milisavljević and B. Predojević, 2007 *Radijska hemija*, **6**, 455
- [2] V. I. Kelemen, E. Yu. Remeta and E. P. Sabad, 1995 *J. Phys. Chem.*, **99**, 1527
- [3] N. T. Padial and D. W. Norcross, 1984 *J. Phys. Chem.*, **88**, 1742
- [4] A. R. Milosavljević, V. I. Kelemen, D. M. Filipović, S. M. Kazakov, V. Pejčev, D. Šević and B. P. Marinković, 2005 *J. Phys. Chem.*, **109**, 2195
- [5] M. S. Rabasović, V. I. Kelemen, S. D. Tošić, D. Šević, M. M. Dovahnych, V. Pejčev, D. M. Filipović, E. Yu. Remeta, and B. P. Marinković, 2008 *J. Phys. Chem.*, **112**, 062713 (11pp)
- [6] H. Cho, R. P. McEachran, S. J. Buckman, D. M. Filipović, V. Pejčev, B. P. Marinković, H. Tanaka, A. D. Stauffer and E. C. Jung, 2006 *J. Phys. B*, **39**, 3781

DEVELOPMENT AND TESTING OF LASER INDUCED BREAKDOWN SPECTROSCOPY TECHNIQUE

Maja Rabasovic⁽¹⁾, Dragutin Sevic^(1,*), Mira Terzic⁽²⁾, Bratislav P. Marinkovic⁽¹⁾

⁽¹⁾ Institute of Physics, Belgrade, Serbia

⁽²⁾ Faculty of Science, University of Novi Sad, Serbia

(*) e c c r

Our system for time-resolved laser induced fluorescence (TR-LIF) measurement is described in [1,2]. First published results could be found in [2]. Nd:YAG laser used in our TR-LIF experiments is powerful enough (365 mJ at 1064 nm, variable OPO output >5mJ), so the system could be used for laser induced breakdown spectroscopy (LIBS), also. In this paper preliminary results regarding development and testing of LIBS technique based on our laser system are presented. The system for LIBS measurements is shown schematically in Fig. 1. Compared to the TR-LIF system presented in [1,2], it is easily noted that focusing lens is added. To be on the safe side regarding Hamamatsu Streak Camera, preliminary experiments were made using OPO output (5 mJ at 400 nm) and Ocean Optics spectrograph. It should be noted that using of streakscope enables time resolved diagnostics.

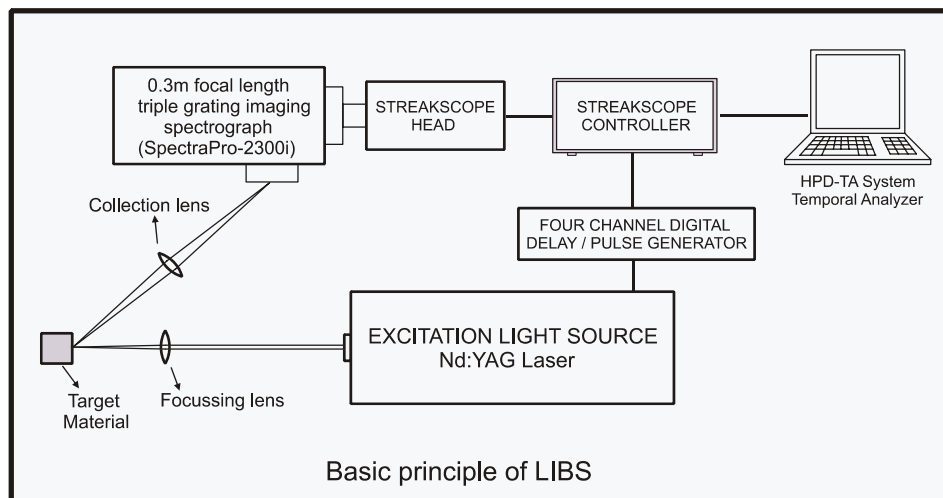


Fig. 1: Our TR-LIF system modified for LIBS experiments.

To test the LIBS technique developed in our laboratory the silver was chosen because there are many references with which we could compare our results [3-7] and because silver is easily obtained. Energy of OPO output was not enough to produce plasma in silver water, but made visible ablations on surface of silver spoon and bracelet.

LIBS signal obtained from silver bracelet is shown in Fig. 2. Ablation of the surface was noticeable after one shot. Because sample was excited by OPO output (400 nm, 5 mJ), the second harmonic (532 nm), fourth harmonic (266 nm) and the idler (800 nm) are also visible on the spectrum.

Sterling silver, alloy used for silver jewelry, contains about 92.5% of silver and 7.5 % of other metals, usually copper. (It seems that lines at about 521 nm corresponding to silver and copper are overlapped on Fig. 2.) The resonance spectral lines of Ag I ($5s^2S_{1/2} - 5p^2_{3/2}$) at 328 nm and ($5s^2S_{1/2} - 5p^2_{1/2}$) at 338 nm have been observed and illustrated in Fig.2. The other two lines denoted in Fig.2 correspond to the transitions: ($5p^2_{1/2} - 5d^2D_{3/2}$) at 521 nm and ($5p^2_{3/2} - 5d^2D_{5/2}$) at 547 nm [8, 9].

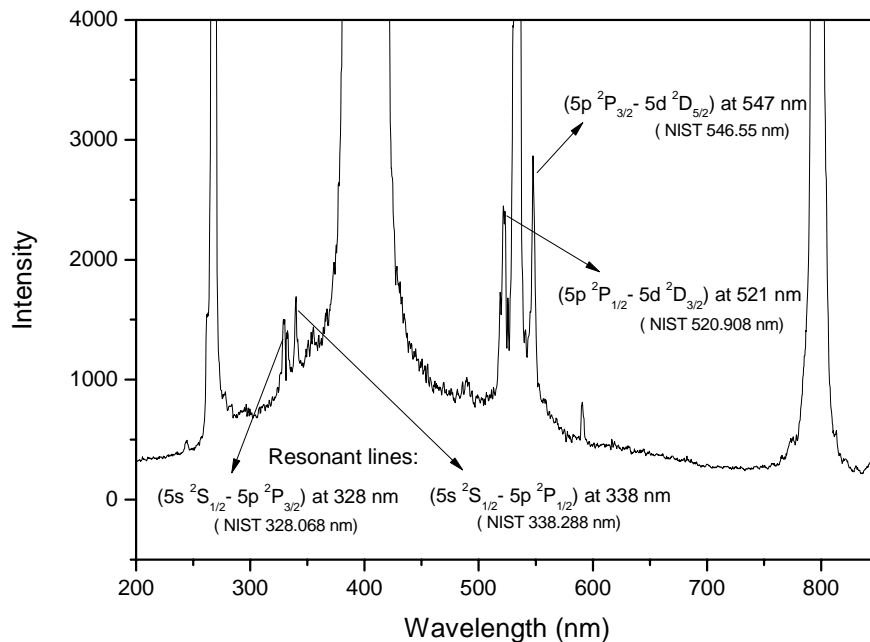


Fig. 2: LIBS signal obtained from silver bracelet.

Conclusion

This work has been supported by the MSTD of the Republic of Serbia under project grant No. 141011 and ESF COST Action FA0906 UV4growth.

Reference

- [1] M. Terzic, B. P. Marinkovic, D. Sevic, J. Jureta, A. R. Milosavljevic, 2008 *Facta Universitatis Series in Technol.* **6**, (1), 105
- [2] M.S. Rabasovic, D. Sevic, M. Terzic, S.Savic-Sevic, B. Muric, D. Pantelic and B.P. Marinkovic, 2009 *Acta Technica Sclonica* **116** 570
- [3] M. Martin, B. Evans, H. O'Neill, and J. Woodward, 2003 *Applied Optics* 6174
- [4] S. Pandhija and A. K. Rai, 2008 *Ramana Journal of Indian Academy of Sciences* **0**, 553
- [5] C. McEnnis, Y. Dikmelik, B. O'Brien, J. B. Spicer, D. Zhang, F. C. De Lucia, Jr. and A. W. Miziolek, 2007 Conference on Lasers and Electro-Optics (CLEO) Baltimore, Maryland
- [6] M. Dzjubenko, S. Kolpakov, D. Kulishenko, A. Priyomko, 2007 OPT'2007, 20 - 22 June 2007, Kharkiv, Ukraine
- [7] A. C. Samuels, F. C. De Lucia, Jr., K. L. McNesby, and A.W. Miziolek, 2003 *Applied Optics* 6205
- [8] Ralchenko, Yu., Kramida, A.E., Reader, J., and NIST ASD Team (2008). NIST Atomic Spectra Database (version 3.1.5), [Online]. Available: <http://physics.nist.gov/asd3> [2010, March 6]. National Institute of Standards and Technology, Gaithersburg, MD.
- [9] J. C. Pickering and V. Zilio, 2001 *Er. h s. J. D* **13** 181.

ESCAMPIG 2010 - Novi Sad, Serbia

GL - General Lecture; TL - Topical Lecture; HT - Hot Topic

	Tuesday 13 th	Wednesday 14 th	Thursday 15 th	Friday 16 th	Saturday 17 th		
8:30		OPENING	TL4 DUJKO	TL5 BRUGGEMAN	TL7 TACCOGNA	8:30	
9:00		GL1 KUSHNER	GL3 MAKABE	GL4 BELMONTE	GL6 CZARNETZKI	9:00	
9:45		TL1 NIEMI	HT3 - GONZALVO	HT5 - STARIKOVSKIY	TL8	9:45	
10:00			HT4 - IWASHITA	HT6 - HUEBNER	AANESLAND	10:00	
10:15		COFFEE	COFFEE	COFFEE	COFFEE	10:15	
10:45		GL2 LOUREIRO	POSTER SESSION 2	GL5 KERSTEN	GL7 DE BENEDICTIS	10:45	
11:30		TL2 PUAC		WILLIAM CROOKES' PRIZE TALK DONKO	HT7 - AKISHEV	11:30	
11:45		HT1 - HORI			ESCAMPIG 2010 REPORT	11:45	
12:00		HT2 - SKORO			CLOSING	12:00	
12:15						12:15	
12:30		LUNCH	LUNCH	LUNCH	LUNCH	12:30	
14:00		REGISTRATION	TL3 TANARRO	EXCURSION	TL6 VAN DIJK	WORKSHOP: Atomic and Molecular Data Needs for Lighting	14:00
14:30			WORKSHOP: Atomic and Molecular Collision Data for Plasma Modelling		WORKSHOP: Plasmas in Medicine		14:30
17:30	COFFEE		COFFEE		17:30		
18:00	POSTER SESSION 1		POSTER SESSION 3		18:00		
20:00	WELCOME RECEPTION 20:00 - 22:00				FREE TIME		20:00
			CONFERENCE DINNER 20:30 - 01:00				