# Europass Curriculum Vitae

| | |
|---|---|
| First name(s) / Surname(s) | **Silviu GURLUI** |
| Address(es) | 11 Carol I Blvd., 700506 Iasi, Romania |
| Telephone(s) | +40740231971 |
| E-mail/ web | sgurlui@uaic.ro; http://spectroscopy.phys.uaic.ro |
| Nationality | Romanian |
| Date of birth | 05.11.1971 |
| Gender | male |
| **Present employment / position** | **Assoc Prof, PhD (Alexandru Ioan Cuza University of Iasi, Romania)** |
| **EDUCATION AND TRAINING** | • 1995 - Graduate the Faculty of Physics, Specialization Technological Physics (**Awards, Diploma of Merit, score 9.92/10**)<br>• 1996 – Graduate Master in Physics, Specialization Physics of Plasmas and Spectroscopy**, score 10/10**<br>2003 – PhD thesis: *Contribution to the study of the processes and phenomena in non-homogeneous discharges plasmas gas mixtures* |
| **Work experience** | **21 years (Iasi, Romania); 12 years (Lille, France)**<br>• 1996-2001: Assistant Prof. , Alexandru Ioan Cuza University of Iasi<br>• 2001-2006: Lecturer, Alexandru Ioan Cuza University of Iasi<br>• 2006-present: Assoc. Prof. PhD. Eng., **Alexandru Ioan Cuza University of Iasi, Romania**<br>• 2004-2016: Invited Prof. **, Lille 1 University of Science and Technology, France,** Laboratoire de Physique des Lasers, Atomes et Molécules |
| **Research stages** | • **Orsay, Paris XI (France), Orléans (France), Angers (France), Lille (France), Innsbruck (Austria)** |
| **Personal skills and competences** | |
| Organisational skills and competences | • Contribute in organization and co-organization of several National and International Conferences, Summer Schools or Workshops<br>• Referent: Physics of Plasmas, IEEE Transactions on Plasma Science, Modern Phys B MQW lasers, Surface Letter, Journal of Quantitative Spectroscopy and Radiative Transfer<br>• Expertise and assessment of national projects |
| Teaching activities (courses) | • **Regional Air Pollution and Global Climate Changes**<br>• **Optical spectroscopy: methods and instrumentation**<br>• **Applied spectroscopy, Optics, Lasers and spectroscopy** |
| Scientific research activity | • Published **80 ISI papers; H-index 16; Times Cited 544**<br>• Competence areas: Lasers, Optics, Spectroscopy, Environment, Physics of Plasmas |

| | |
|---|---|
| **Additional information** | • **Head of Atmosphere Optics, Spectroscopy and Lasers Laboratory (LOA-SL)** http://spectroscopy.phys.uaic.ro/ |
| **Network** | ➢ Member of: **ACTRIS and AERONET (NASA)** networks: http://aeronet.gsfc.nasa.gov/cgi-bin/type_one_station_opera_v2_new?site=Iasi_LOASL&nachal=2&level=1&place_code=10<br>➢ From 2017 LOASL becomes member of the facility for antiproton and ion research **(FAIR), Darmstadt, Germany** https://www.gsi.de/forschungbeschleuniger/fair.htm<br>➢ Founder member of SNSIM (National Society of Environmental Science) http://snsim.ro/?page_id=6<br>➢ COST Management Committee, MPNS COST Action MP1208 |
| **Language** | **English, French** |

Self-assessment

*European level (*)*

| **Understanding** | | | | **Speaking** | | | | **Writing** | |
|---|---|---|---|---|---|---|---|---|---|
| Listening | | Reading | | Spoken interaction | | Spoken production | | | |
| C2 | Proficient user | C2 | Proficient user | C2 | Proficient user | C2 | Proficient user | C2 | Proficient user |

*(*) Common European Framework of Reference for Languages*

The grid consists of three broad levels as follows:
- Basic user (levels A1 and A2);
- Independent user (levels B1 and B2);
- *Proficient user (levels C1 and C2).*

*Please replace the above example with the appropriate level you scale yourself. For example, level 1 (A, B, C) is lower than level 2 (A, B, C)*

| | |
|---|---|
| **Digital competence** | advanced knowledge of mathematics, computer science (algorithms, programming techniques, software) |
| **Awards** | [see web-site http://spectroscopy.phys.uaic.ro/Headlines.html]<br>• **Gold Medal**, The Hamangia Thinker for **Novel Romanian LIDAR system**, XVII-th International Exhibition of Inventics, Research and Technological Transfer "INVENTICA 2013", and the XVII-th International Conference of Inventics, Iasi, 2013<br>• Special Prize of the International Personel of Academy (KIEV), XVII-th International Exhibition of Inventics, Research and Technological Transfer "INVENTICA 2013", and the XVII-th International Conference of Inventics, Iasi, 2013 |
| **ANNEXES** | Publications and Projects ........................................................ pg 3-10 |

# Appendices

**Books**

1. G. Strat, M. Strat, S. Gurlui, C. Focsa, D. Dimitriu, Self organization in nanomaterials, vol 5, p. 53-91, Ed. INOE ( 2007).
2. S. Gurlui, M. Delibaş, Optics. Exercises and problems, ed. TehnoPress, Iaşi, 445p (2005).
3. S. Gurlui, D. Dimitriu, Plasma double layers, ed. TehnoPress, Iaşi, 346p (2005).

**Director/ Research Projects http://spectroscopy.phys.uaic.ro/PROJECTS.html**

1. SATY: Satellite hybrid micro-thrusters, Romanian Space Agency (ROSA), 2017-2018 (**370.000 EURO**)
2. AiRFRAME: Aerosol properties retrieval from remote sensing spectroscopic measurements (partner UAIC), (ROSA), 2017-2018 (**45.000 EURO**)
3. LEO: LOASL's Earth Observatory, Romanian Space Agency (ROSA), ID 499/2016-2017 (**1.000.000 EURO**)
4. ELIAN: Extreme Light Induced Ablation Plasma Jet And Nano-patterning, ELI-NP, CAPACITIES / RO-CERN E03/30.06.2014, 2014-2016 (**140.000 EURO**)
5. DARLIOES: Fast Laser Imaging, Detection and Ranging Of Aerosol Emissions in Aircraft Plumes, Romanian Space Agency (ROSA) within Space Technology and Advanced Research (STAR) Program. Project nr. 98/29.11.2013, 2013-2016 (**177.000 EURO**)
6. "Dynamics of laser ablation plasmas: fundamentals and applications to pulsed laser deposition of thin films": bilateral project ANCS-ANR (Romania – France), ID project PN-II-CT-RO-FR-2012-1-0058; 2013-2014.
7. "The study of polymer-laser radiation interactions in controlled atmosphere. Laser ablation nanostructured thin films layers. Applications" PN-II-ID-PCE-2011-3-0650, 2011-2014. (**350.000 EURO**)
8. "Join Physicist in Festival (My Physics, My World)" FP7-PEOPLE, 244978/2009, 2009.
9. RADO: "Romanian Atmospheric Research 3D Observatory" funded by Innovation Norway, STVES 115266/2008; 2008-2010. (**247.600 EURO**)
10. "New methods and technologies to investigate complex plasma nanostructures obtained through laser ablation. Technological applications" CEEX type II – Excellence research projects for young researchers, 5879/2006, ET 70, 2006-2008. (**31.000 EURO**)
11. ROLINET: "Romanian Network of LIDAR systems" PN II Cooperation, 31-002/2007, 2007-2010. (**71.000 EURO**)
12. "Study of the physical processes and phenomena from plasma double layers and biological cell membranes. Analogies and applications" CNCSIS, 33373/2004, AT 71, 2004-2005.
13. "Study of the processes and phenomena from electrical discharges (un-homogeneous) in atomic and molecular gases. Theoretical models and applications" CNCSIS, 33531/2002, AT 284, 2002-2003.

**Articles (web of Science)**

1. R. W. Schrittwieser, C. Ionita, C. T. Teodorescu-Soare, O. Vasilovici, S. Gurlui, S. A. Irimiciuc and D. G. Dimitriu, Spectral and electrical diagnosis of complex space-charge structures excited by a spherical grid cathode with orifice, Phys. Scr. 92 044001 (2017)
2. S. A. Irimiciuc, S. Gurlui, P. Nica, C. Focsa1, and M. Agop, A compact non-differential approach for modeling laser ablation plasma dynamics, Journal of Applied Physics 121, 083301 (2017)
3. V. Pelin, I.Sandu, S.Gurlui, M.Brinzila, V.Vasilache, I.G. Sandu, Evaluation of the Artificial Aging Rate Through UV Radiation Exposure of Indigenous Carbonate Rocks, Treated with Water-solvated Nano-dispersions, with the Interest of Consolidation and the Formation of a Waterproof Character, Revista De Chimie, Volume: 67 Issue: 12 Pages: 2568-2572, (2016)
4. V Pelin, I Sandu, M Munteanu, C T Iurcovschi, S Gurlui, AV Sandu, V Vasilache, M Brânzilă and I G Sandu, Colour change evaluation on UV radiation exposure for Păun-Repedea calcareous geomaterial, INTERNATIONAL CONFERENCE ON INNOVATIVE RESEARCH - ICIR EUROINVENT 2016 Book Series: IOP Conference Series-Materials Science and Engineering, Volume: 133, Article Number: UNSP 012061, DOI: 10.1088/1757-899X/133/1/012061
5. I. Caraman, L. Dmitroglo, I. Evtodiev, L. Leontie, D. Untila, S. Hamzaoui, M. Zerdali, O. Şuşu, G. Bulai, S. Gurlui, Optical properties of ZnO thin films obtained by heat treatment of Zn thin films on amorphous SiO2 substrates and single crystalline GaSe lamellas, THIN SOLID FILMS Volume: 617 Special Issue: SI Pages: 103-107 Part: B Published: OCT 30 2016
6. R. Danaca, L. Leontie, A. Carlescub, S. Shovac, V. Tiron, G.G. Rusu, F. Iacomi , S. Gurlui , O. Șusu, G. I. Rusu, Electric conduction mechanism of some heterocyclic compounds, 4,4′-bipyridine and indolizine derivatives in thin films, Thin Solid FilmsVolume 612, 1 August 2016, Pages 358–368
7. V. Pelin, I. Sandu, S. Gurlui, M. Brânzila, V. Vasilache, E. Borş, I.G. Sandu, Preliminary investigation of various old geomaterials treated with hydrophobic pellicle, Color Research and Application, 41 (3), pp. 317-320. (2016) DOI: 10.1002/col.22043
8. G. Bulai, I. Dumitru, M. Pinteala, C. Focsa, S. Gurlui, Magnetic nanoparticles generated by laser ablation in liquid Digest Journal of Nanomaterials and Biostructures, 11 (1), pp. 283-291 (2016)
9. N. Cimpoeşu, L. C. Trincă, G. Dascălu, S. Stanciu, S. Gurlui, D. Mareci, Electrochemical characterization of a new biodegradable FeMnSi alloy coated with hydroxyapatite-zirconia by PLD technique, Journal of Chemistry, art. no. 9520972 (2016) DOI: 10.1155/2016/9520972
10. M. M. Cazacu, O. G. Tudose, A. Timofte, O. Rusu, L. Apostol, L. Leontie, S. Gurlui, Applied ecology and environmental research, Volume: 14 Issue: 3 Pages: 183-194 Published: 2016
11. L. Belegante, M.M. Cazacu, A. Timofte, F. Toanca, J. Vasilescu, M.I. Rusu, N. Ajtai, H.I. Stefanie, I. Vetres, A. Ozunu, S. Gurlui, Case study of the first volcanic ash exercise in romania using remote sensing techniques, Environmental Engineering and Management, Journal Volume: 14 Issue: 11 Pages: 2503-2514 Published: NOV 2015
12. G. Bulai, L. Diamandescu, I. Dumitru, S. Gurlui, M. Feder, O.F. Caltun, Effect of rare earth substitution in cobalt ferrite bulk materials, Journal of Magnetism and Magnetic Materials, 390, art. no. 60148, pp. 123-131(2015) DOI: 10.1016/j.jmmm.2015.04.089
13. G. Bulai, S. Gurlui, O. F. Caltun, C. Focsa, Pure And Rare Earth Doped Cobalt Ferrite Laser Ablation: Space And Time Resolved Optical Emission Spectroscopy, Digest Journal of Nanomaterials and Biostructures, Volume: 10 Issue: 3 Pages: 1043-1053, Published: JUL-SEP 2015
14. A. Timofte, L. Belegante, M. M. Cazacu, B. Albina, C. Talianu, S. Gurlui, Study of planetary boundary layer height from LIDAR measurements and ALARO model, Journal of Optoelectronics and Advanced Materials, 17 (7-8), pp. 911-917 (2015)
15. I. Stirbu, P. Vizureanu, R. Cimpoesu, G. Dascalu, S. Gurlui, M. Mernevig, M. Benchea, N. Cimpoesu, P. Postolache, Advanced metallic materials response at laser excitation for medical application, Journal of optoelectronics and advanced materials, Vol. 17, No. 7-8, July – August 2015, p. 1179 - 1185
16. M. M. Cazacu, A. Timofte, F. Unga, B. Albina, S. Gurlui, Aeronet data investigation of the aerosol mixtures over iasi area, one-year time scale overview, Journal of Quantitative Spectroscopy and Radiative Transfer, 153, pp. 57-64 (2015)
17. SA Irimiciuc, M. Agop, P. Nica, S. Gurlui, D. Mihailescu, S. Toma, C. Focsa, Dispersive effects in laser ablation plasmas, Japanese journal of applied physics, Volume: 53 Issue: 11, Article Number:

116202, DOI: 10.7567/JJAP.53.116202, 2014
18. O. Pompilian, G. Dascalu, I. Mihaila, S. Gurlui., M. Olivier, P. Nemec, V. Nazabal, N. Cimpoesu, C. Focsa, Pulsed laser deposition of rare-earth-doped gallium lanthanum sulphide chalcogenide glass thin film, Applied physics a-materials science & processing, Volume: 117 Issue: 1 Pages: 197-205, DOI: 10.1007/s00339-014-8359-6 (2014)
19. S. Gurlui, O. Niculescu, D. G. Dimitriu, C. Ionita, R. W. Schrittwieser – Elementary processes in the dynamics of two simultaneously excited fireballs in plasma, International Journal of Mass Spectrometry Volume: 365 Special Issue: SI Pages: 42-47 (2014)
20. B. Albina, M. M. Cazacu, A. Timofte, D.G. Dimitriu, S. Gurlui, Studies of Planetary Boundary Layer by Infrared Thermal Imagery, TIM 2013 PHYSICS CONFERENCE, Book Series: AIP Conference Proceedings, Volume: 1634 Pages: 174-179, DOI: 10.1063/1.4903034, Published: 2014
21. G. Dascalu, G. Pompilian, B. Chazallon, O. F. Caltun, S. Gurlui, C. Focsa, Femtosecond pulsed laser deposition of cobalt ferrite thin films, Applied Surface Science, Volume 278, p. 38-42 (2013) 10.1016/j.apsusc.2013.02.107
22. O.G. Pompilian, S. Gurlui, P. Nemec, V. Nazabal, M. Ziskind, C. Focsa, Plasma diagnostics in pulsed laser deposition of GaLaS chalcogenides, APPLIED SURFACE SCIENCE, Volume: 278 Pages: 352-356, DOI: 10.1016/j.apsusc.2012.11.069, Published: AUG 1 2013
23. L. Balika, C. Focsa, S. Gurlui, S. Pellerin, N. Pellerin, D. Pagnon and M. Dudeck, Laser ablation in a running hall effect thruster for space propulsion, Appl. Phys A, DOI 10.1007/s00339-012-7211-0, (2012)
24. G. Dascalu, O. Pompilian, B. Chazallon, V. Nica, O. F. Caltun, S. Gurlui, C. Focsa, Rare earth doped cobalt ferrite thin films deposited by PLD, Applied Physics A, 110 (4), pp.: 915-922 (2013) DOI10.1007/s00339-012-7196-8
25. F. Unga, M. M. Cazacu, A. Timofte, D. Bostan, A, Mortier, D. D. Dimitriu, S. Gurlui, Philippe Goloub, Study of tropospheric aerosol types over Iasi, Romania, during summer of 2012, Environmental Engineering and Management Journal, Vol. 12, No. 2, 297 (2013)
26. N. Cimpoesu, A. D. Ursanu, S. Stanciu, R. Cimpoesu, B. Constantin, C. Paraschiv, S. Gurlui, Preliminary Results of Copper Based Shape Memory Alloys Analysis used for MEMS Applications, Innovative manufacturing engineering, Book Series: Applied Mechanics and Materials, Volume: 371 Pages: 368-372, DOI: 10.4028/www.scientific.net/AMM.371.368, Published: 2013
27. S. Gurlui, O. Niculescu, D.G. Dimitriu, C. Ionita, R. Schrittwieser, Spectral Investigations of Two Simultaneous Fireballs in Plasma, TIM 2012 PHYSICS CONFERENCE, Book Series: AIP Conference Proceedings, Volume: 1564 Pages: 200-204, DOI: 10.1063/1.4832818, Published: 2013
28. P. Nica, M. Agop, S. Gurlui, C. Bejinariu, C. Focsa, Characterization of Aluminum Laser Produced Plasma by Target Current Measurements, Jpn. J. Appl. Phys. 51, 106102 (2012)
29. L. Balika, C. Focsa, S. Gurlui, S. Pellerin, N. Pellerin, D. Pagnon and M. Dudeck, Laser-induced breakdown spectroscopy in a running Hall Effect Thruster for space propulsion, Spectrochimica Acta Part B 74-75, 184-189 (2012)
30. M. M. Cazacu, A. Timofte, A., C. Talianu, D. Nicolae, M. N. Danila, F. Unga, D.G. Dimitriu, S. Gurlui, Grímsvötn Volcano: Atmospheric volcanic ash cloud investigations, modelling-forecast and experimental environmental approach upon the Romanian area, Journal of Optoelectronics and Advanced Materials ,14 ( 5-6 ) pp. 517 - 522 (2012)
31. M. N. Danila, S. Gurlui, M. M. Cazacu, Python Utility: Laser-atmosphere interaction extended to Network Data Management, 2012, 5th Romania tier 2 federation grid, cloud & high performance computing science (RO-LCG), Pages: 90-92, Published: 2012
32. S. Gurlui, C. Focsa, Laser Ablation Transient Plasma Structures Expansion in Vacuum, IEEE transactions on plasma science Volume: 39 Issue: 11 Special Issue: SI Pages: 2820-2821 Part: 1 Published: NOV 2011
33. M Agop, P Nica, S Gurlui, C Focsa, D Magop and Z Borsos, The chaotic atom model via a fractal approximation of motion, Phys. Scr. 84 045017 (2011) doi:10.1088/0031-8949/84/04/045017
34. A. Largeanu, G.O. Pompilian, D.G. Galusca, M. Agop, S. Gurlui, Pulsed laser deposition of NI thin films on metallic substrate, University Politehnica of Bucharest Scientific Bulletin-Series a-Applied Mathematics and Physics, 73(3):195-202, (2011)
35. A. Timofte, M. M. Cazacu, R. Radulescu, C. Talianu, D. Dimitriu, S. Gurlui, Romanian LIDAR

investigation of the EYJAFJALLAJOKULL volcanic ash, Environmental Engineering and Management Journal, Vol.10, No. 1, 91-97 (2011)
36. M. M. Cazacu, A. Timofte, D. Dimitriu, S. Gurlui, Complementary atmospheric urban pollution studies in the north-east region of Romania, Iasi County, Environmental Engineering and Management Journal, Vol.10, No. 1, 139-145 (2011)
37. R. H. Cimpoesu, G. O. Pompilian, C. Baciu, N. Cimpoesu, C. Nejneru, M. Agop, S. Gurlui, C. Focsa, Pulsed laser deposition of poly (L-Lactide) acid on nitinol substrate, Optoelectronics and Advanced Materials-Rapid Communications Vol 4, ISS.12, p.2148-2153 (2010)
38. C. Ursu, O. G. Pompilian, S. Gurlui, P. Nica, M. Agop, M. Dudeck and C. Focsa, Al2O3 ceramics under high-fluence irradiation: plasma plume dynamics through space- and time-resolved optical emission spectroscopy, Applied physics a: materials science & processing, Volume 101, Number 1, 153-159, (2010), DOI: 10.1007/s00339-010-5775-0
39. P. Nica, M. Agop, S. Gurlui and C. Focsa, Oscillatory Langmuir probe ion current in laser produced plasma expansion, Epl-Europhys LETT 89, 6 Art no: 65001 (2010)
40. M. Agop, P. E. Nica, S. Gurlui, C. Focsa, V. P. Paun and M. Colotin, Implications of an extended fractal hydrodynamic model, the European physical journal D - atomic, molecular, optical and plasma physics, Volume 56, Number 3, 405-419, (2010) DOI: 10.1140/epjd/e2009-00304-5
41. M. Agop, P. Nica, S. Gurlui,C. Focsa, Fractal hydrodynamic model of high-fluence laser ablation plasma expansion, International symposium on high power laser ablation 2010, Book Series: AIP Conference Proceedings, Volume: 1278 Pages: 612-622, DOI: 10.1063/1.3507153, Published: 2010
42. G. Strat, I. Lihtetchi, M. Strat, S. Gurlui, Structure and mechanical properties of nanocomposites based on polypropylene - Clay hybrids, Materiale Plastice, 46 (4), pp. 435-438 (2009);
43. O. Niculescu, P. Nica, S. Gurlui, N. Forna, I. Casian-Botez, I. Ionita, B. Constantin, B (Constantin, G. Badarau, Experimental Investigations of Polymer Plasma Laser Ablation, Materiale plastice, Volume: 46 Issue: 3 Pages: 336-338, Published: SEP 2009
44. M. Colotin, G. O. Pompilian, P. Nica, S. Gurlui, V. Paun, M. Agop, Fractal transport phenomena through the scale relativity model, Acta Physica Polonica A, 116 (2), pp. 157-164 (2009);
45. P. Nica, P.Vizureanu, M. Agop, S. Gurlui, C. Focsa, N. Forna, P. D. Ioannou, Z. Borsos, Experimental and theoretical aspects of aluminum expanding laser plasma, Japanese Journal of Applied Physics, 48 (6), art. no. 066001 (2009);
46. C. Focsa, P. Nemec, M. Ziskind, C. Ursu , S. Gurlui, V. Nazabal, Laser ablation of AsxSe100-x chalcogenide glasses: Plume investigations, Applied Surface Science, 255 (10), pp. 5307-5311 (2009);
47. C. Ursu, S.Gurlui, C. Focsa, G. Popa, Space- and time-resolved optical diagnosis for the study of laser ablation plasma dynamics, Nuclear Instruments and Methods in Physics Research, Section B: Beam Interactions with Materials and Atoms, 267 (2), pp. 446-450 (2009);
48. S. Gurlui, D.G. Dimitriu, C. Ionita, R.W. Schrittwieser, Spectral investigation of a complex space charge structure in plasma, Romanian Journal in Physics, 54 (7-8), pp. 705-710 (2009);
49. G. Strat, S. Gurlui, M. Strat, A. Farcas, S. Stratulat, Studies of the self-organization phenomena in polymer materials, Journal of Optoelectronics and advanced materials, Vol. 10, No. 11, November p. 2854 – 2858 (2008);
50. C. Focsa, M. Ziskind, C. Ursu, S. Gurlui, D. Pagnon, S. Pellerin, N. Pellerin, M. Dudeck, Laser - BnSiO2 Ceramics Interaction: simulation of the energy deposition on dielectric wall surfaces in Hall thrusters, J. Optoelecron. Adv. Mater. 10 2380 (2008);
51. S. Gurlui, M. Agop, P. Nica, M. Ziskind, C. Focsa, Experimental and Theoretical Investigations of a Laser Produced Aluminum Plasma, Phys. Rev. E, 78, 026405 (2008). Article selected for publication in the Virtual Journal of Ultrafast Science (Vol. 7, No. 9, September 2008)
52. I. Grecu, G. Strat, S. Gurlui, V. Grecu, I. Lihtetchi, M. Strat, S. Stratulat, C. Picealca, Structure and mechanical properties of nanocomposites based on polypropilene and polyethylene, Journal of Optoelectronics and advanced materials, 10, 1408 (2008);
53. G. Strat, I. Grecu, S. Gurlui, M. Strat, V. Grecu, I. Lihtetchi, S. Stratulat, Fluorescence studies of the self- organization phenomena in film state and solutions of some polyurethanes, Journal of Optoelectronics and advanced materials, 10, 1519 (2008);
54. M. Agop, P. Nica, S.Gurlui, G. Strat, M. Strat, Fractal space-time and ball lightening as a self-

organizing process in laser produced plasma, Journal of Optoelectronics and advanced materials, 10, 1526 (2008);

55. C. Mihesan, M. Ziskind, B. Chazallon, E. Therssen, P. Desgroux, S. Gurlui, and C. Focsa, IR wavelength-selective laser desorption via O-H and C-H stretching modes, Applied Surface Science 253 (3), 1090 (2006);
56. S. Gurlui, M. Agop, M. Strat, G. Strat, S. Bacaita and Adina Cerepaniuc, Some experimental and theoretical results on the anodic patterns in plasma discharge, Physics of Plasmas 13, 063503 (2006);
57. S. Gurlui, M. Sanduloviciu, M. Strat, G. Strat, C. Mihesan, M. Ziskind, and C. Focsa, Dynamic space charge structures in high fluence laser ablation plumes, Journal of Optoelectronics and Advanced Materials, 8, 148 (2006);
58. M. Strat, S.Vasiliu, G. Strat, C. Luca, I. Grecu, S. Gurlui, S. Stratulat, Spectral and thermogravimetric analysis of some poly(carboxybetaine)s polymers Journal of Optoelectronics and advanced materials, 8, 181 (2006);
59. D. G. Dimitriu, S. Gurlui, M. Aflori, L. M. Ivan, On the physical mechanism at the origin of multiple double layers appearance in plasma, Plasma 2005, Book Series: AIP conference proceedings, Volume: 812, Pages: 149-152, Published: 2006
60. S. Gurlui, M. Sanduloviciu, C. Mihesan, M. Ziskind, C. Focsa, Periodic phenomena in laser-ablation plasma plumes: A self-organization scenario, Plasma 2005, Book Series: AIP conference proceedings, Volume: 812, Pages: 279-282, Published: 2006
61. S. Gurlui, D. G. Dimitriu, G. Strat, M. Strat, Study of the anode plasma double layer: optogalvanic detectors, Plasma 2005, Book Series: AIP conference proceedings, Volume: 812, Pages: 333-336, Published: 2006
62. C. Mihesan, S. Gurlui, M. Ziskind, B. Chazallon, G. Martinelli, H. Zeghlache, M. Guignard, V. Nazabal, F. Smektala, C. Focsa, Photo-excited desorption of multi-component systems: Application to chalcogenide glasses, Appl. Surf. Sci., 248, 224 (2005);
63. S. Gurlui, M. Agop, M. Strat, G. Strat, S. Bacaita, Experimental and theoretical inveastigations of the anode double layer, Jpn. J. Appl. Phys. 44, 3253 (2005);
64. I. Grecu, G. Strat, S. Gurlui and. M. Strat, Photocromic properties of some diazobenzene copolymers in solutions, Journal of Optoelectronics and Advanced Materials, 7, 929 (2005);
65. M. Strat, G. Strat, V. Scutaru, S. Gurlui and Irinel Grecu, Optical and Dielectric Properties of New Diazobenzene Copolyethers Embedded in Polymer Matrices, Macromolecular Symposia, 212, 407 (2004);
66. M. Strat, G. Strat, S. Gurlui, Ordered plasma structures in the interspace of two independently working discharges, Physics of Plasmas, 10, 3592 (2003);
67. M. Strat, M. Popa, G. Strat, I.C. Alupei, S. Gurlui, The study of the structure and optical properties of gellan-PVA, gellan-PVP and gellan-PVI composites, 11TH international symposium on electrets (ISE 11), Pages: 426-429, Published: 2002
68. M. Strat, G. Strat, S. Gurlui and C. Alupei, The Study of the Optical Properties of Some Composite Based on of Gellan and Electroactive Synthetic Polymers, Mater. Plast. 39, 202 (2002);
69. M. Girtan, G. I. Rusu, G.G. Rusu, S. Gurlui, Influence of oxidation conditions on the properties of indium oxide thin films, Appl. Surf. Sci., 162, 492 (2000);
70. M. Strat, G. Strat, S. Gurlui, Basic processes in discharge plasma double layers, J. Phys. D: Appl. Phys., 32, 34 (1999);
71. M. Strat, G. Strat, S. Gurlui, Free double layers in Ar glow discharges, International conference on phenomena in ionized gas, VOL I, PROCEEDINGS, Pages: 53-54, Published: 1999
72. M. Strat, M. Delibas, G. Strat, N. Hurduc, S. Gurlui, Optic and Spectral Characteristics of Some Aromatic Co-Polyethers Embedded in Polymer Matrices, J. Macromol. Sci. Pure Phys., 37, 387 (1998);

**Invited Lectures**

1. S. Gurlui, P. Nica, M. Agop, M. Osiac, C. Focsa, *Two-temperature plasmas generated by femtosecond laser ablation of metallic targets,* 16th International conference on plasma, physics and applications, June 20-25, 2013, Magurele, Bucharest, Romania
2. S. Gurlui and C. Focsa, *Development of Laser-Produced Plasma Technology. Fundamentals and Applications*, 8th BPU, the 8th General Conference of Balkan Physical Union, 5-7 July 2012, Constanta, Romania.
3. O. G. Pompilian, G. Dascalu, S. Gurlui, C. Focsa, *Processing and characterization of advanced materials by laser ablation techniques*, 9th International Conference on Physics of Advanced Materials, 20 - 23 September 2012, Iasi, Romania;
4. O.G. Pompilian, G. Dascalu, S. Gurlui, C. Focsa, *Laser-induced plasma: fundamentals and applications*, Physics Conference TIM-12, 27-30 November 2012, Timisoara, Romania.
5. C. Focsa, M. Ziskind, B. Chazallon, S. Gurlui, V. Nazabal, P. Nemec, *Laser ablation fundamentals and applications to the study of some inorganic materials with high technological potential*, 10th International conference Solid State Chemistry, Pardubice, Czech Republic, June 10-14, 2012
6. S. Gurlui. C. Focsa, P. Nica, M. Osiac, *High-Fluence Laser Ablation Plasma Dynamics: Fundamentals and Applications*, the 4-th National Conference of Applied Physics (CNFA-2010) in Iasi, Romania.
7. C. Focsa, S. Gurlui, M. Ziskind, *Transient plasmas generated by high-fluence laser ablation: Fundamentals and applications,* International Balkan Workshop on Applied Physics, Constanta, Roumanie, 7-9 juillet 2010
8. S. Gurlui, G. Strat , D. Lihteţchi, V. Hurduc and M. Strat, *Nanostructured surfaces and nanoagregates of photoreactive polymers in solutions and film sate*, International Balkan Workshop on Applied Physics, Constanta, Roumanie, 7-9 juillet 2010
9. S. Gurlui, E. Buruiana, T. Buruiana, G. Strat, M. Strat, V. Pohoata, *Fluorescence properties of some polyurethane derivatives with stilbene and pyrene rings*, 47th microsymposium. ADVANCED POLYMER MATERIALS FOR PHOTONICS AND ELECTRONICS, PRAGUE, 15 – 19 July 2007
10. G. Strat, M Strat, S. Gurlui and D. Dimitriu, *Optogalavanic effect in nonlinear systems*, BPU-5, Vrnjacka Banja, Serbia and Montenegro, August 25-29, 2003

**Organizing committee, member**:

- Summer School: Physics and chemistry of the atmosphere: from laboratory experiments to field campaigns, “Alexandru Ioan Cuza” University of Iasi, Romania, 2 - 14 July, 2006
- Workshop entitled “Modern Techniques in Atmospheric Physics and Chemistry”, University of Szeged, Hungary, 2 - 4 Mai, 2007;
- Physics and chemistry of the atmosphere: from laboratory experiments to field campaigns. "Ovidius" University of Constanta, Romania, 10 - 16 July, 2008.

# Summary of novel projects

**Keywords:** laser spectroscopy, atmosphere optics, optical systems, satellite engine, LIDAR, ESA, ROSA

## Sensors for robotic planetary exploration missions

Beginning with successful launch of the first satellite, sending both humans and robots beyond Low Earth Orbit (LEO) and establishing sustained access to various destinations such as the Moon, asteroids, Mars, etc, more than fifty years of human space science activity have been already focused developing analytical instrumentation for use in space and on planetary surfaces, to better understanding the fundamentals of our Universe and the solar system in which we live. Majority from US and Russian space programs, more than 110 robotic missions to the Moon, 33 to the Mars and 38 to the Venus and Mercury are known using high resolution spectroscopy techniques able to investigate the physic-chemical properties both of the planetary soils but also of the edge atmosphere and environmental mixture gas behavior. Because of the space environment extreme conditions, special conditions must be deployed by the used instruments: high spectral resolutions, simultaneous multi-element detection, good sensitivity for many elements, minimal or no sample preparation, rapid analysis, ability to use in various coupled automated operations, etc. In order to meet these goals, current and further rover missions include various instrumentations techniques as the following: APXS (Alpha-Photon-X-Ray Spectrometry), ASSA (Alpha-Scattering Surface Analyser), Gama ray, Mid-and Near-Ir, Mossbauer, Neutron, XRD (X-Ray Diffraction), XRF (X-Ray fluorescence), LIBS (Laser induced Breakdown Spectroscopy) and Raman Spectroscopy. Because of various advantages in time and costs associated with very good results, LIBS and Raman Spectroscopy become the power tools techniques for spacecraft instrumentation.

**NASA- ChemCam** instruments used on the Mars Science Laboratory (MSL) and the huge volume recent literature, strengthens the importance of laser ablation and Raman Spectroscopy for research space programs. Laser Ablation (LA) becomes the challenge goal in the used techniques to investigate spaces bodies and, furthermore, the power instrument in the asteroid flyby mission was proposed by Max Plank Institute, 1986 (Facility for Remote Analysis of Small Bodies: F.R.A.S). After 3 years, two Mars bound Soviet space craft (Phobos 1 and 2) having the LIMA-D instrument (according F.R.A.S.) use laser ablation pulses to investigate the particles evaporated from the irradiated surface of rock (1-2 mm in diameter) and situated at 30-80 m from the Space Craft Mass Spectrometer. Both Phobos, ChemCam, etc, and the laboratory measurements prove altogether the efficiency of the LIBS coupled with the Raman Spectroscopy, there are still a lack of data instruments space missions. Even the advantage of the two techniques is already used in the mission, LIBS (ChemCam, Rover) and Raman Spectroscopy (further ExoMars missions) several problems are still unresolved: to increase and improve the analyte signal response while minimizing the background continuous emissions, etc. As following, control of ambient pressure and composition, using single or dual pulsed lasers, laser wavelength, etc can significantly improve emission intensities, limits of detection, and reproducibility.

The project is focused to design and validate the miniaturized equipment able to working in exploratory space missions with severe constrains (environment gas mixture, pressure, temperature, etc). Our technology is based to enhance the ablative and emissive stage of the plasma by means dual-pulse LIBS in order to enhance the analyte peak-to-base and signal-to-noise ratios, and atoms and ions line spectra. Following, time-space resolved emissions Raman Spectroscopy is used to measures in a second the elemental compositions of the soil/rock. Depending of the space missions, different experimental conditions will be taking into account. Even for laboratory experiments, simulations experimental real conditions will take into consideration as the following: effects of airborne dusts to the optics (surface abrasion, surface contamination, electrostatic charging of nonconducting surface), effects of the vibrations and a large temperatures extremes typically encountered (from -147 to 27 $^{o}$C from Viking Orbiter data), pressure gas effects [Mars (7 Torr CO2), Venus (90 atm, CO2), Moon, 3*10^(-15) atm], etc, damage optical alignment.

## Satellite hybrid micro-thrusters

Significant challenges and advances in space propulsion have occurred over the last years, with plasma being a significant issue for satellite propulsion technology. To maintain the satellites in geostationary orbit with North-South and East-West corrections, electrical spacecraft thrusters are recognized as one of the most interesting concepts because of their performances, mainly in the economy in propellant mass, efficiency, etc. In order to simulate the behavior of the plasma thrusters, especially theirs stability, complex experimental and theoretical studies must be taken into account. Under the impact of ions with divergent trajectory related to the thrusters' axis (mainly due to ion sputtering) surface erosion is generally evidenced. Moreover, a superimposed "anomalous" erosion process is observed in several plasma propulsion engines (e.g. Hall thruster). This erosion is characterized by regular visible ridges. Some instability in the DC plasma has been also evidenced. Even these observations and instability of the thruster trajectory are very important and no satisfying theory to explain this "anomalous" erosion is reported. The presence of numerous and complex processes like electron secondary emission, sputtering, normal or abnormal erosion, sheath potential modifications or solid particle emission turns the effort of completely controlling the dielectric wall behavior into a difficult task. Moreover, the deposition of energy by the plasma discharge modifies the surface temperature and consequently may affect the evolution of the different wall processes. Because of their importance not only in fundamental study but mostly in applications in space satellite propulsions, new experimental and theoretical research must be further considered. According to the European Space Agency (ESA), NASA's Jet Propulsion Laboratory, Marshall Space Flight Centre, Japan Aerospace Exploration Agency [JAXA] etc., one of the main objectives in the frame of future aerospace missions is focused on the next generation of microsatellites by developing tools for science and exploration but also utilitarian activities related to daily life (such as the European satellite-based positioning system and earth observation). These Aerospace Corporations underlined the importance of developing new micro-technologies and to determine their future impact on space systems. Therefore, ESA's new scientific and Earth observation missions require sophisticated propulsion systems to reach planets such as Mars and in some cases bring back to Earth samples from these planets. This is a new challenge for propulsion systems and components such as micro-thrusters. In order to reduce the costs and to increase the reliability, Small Satellites become a subject for all governmental, industrial, scientific and military communities' around the world. Moreover, older single satellites with large dimensions may be further replaced by a cluster of several more versatile and robust micro-thrust satellites. Known chemical micro-propulsion thrusters (Cold gas system, Bi-propellant thrusters Mono-propellant thrusters) have limited specific impulse of thrust (ISP) and electric acceleration (by field strength and gas density). On the other hand, the electric micro-propulsion although existing in a huge variety of configurations (Colloid thrusters system, Field Emission Electric Propulsion-FEEP, Plasma pulsed thruster, Micro Ion Thruster-μIT, Hall Effect Thruster [SNECMA, ESA, CNRS-France]), Vaporizing Liquid Thruster-VLT, Double-Discharge Pulsed Plasma Thruster, Micro Microwave-Discharge Ion Thruster, DC and Arcjet Thruster [Komurasaki 2003, research field in the Osaka University, Japan], Solar Thermal Propulsion may have poor repeatability, high noise level at minimum impulse bit (MIB), inefficiency in propellant and power usage and inability to operate in continuous operating mode. One of the main advantages of Electric Propulsion with respect to the Chemical Propulsion is the high specific impulse that implies a significant saving in propellant mass, very good controllability due to the possibility of generating very low thrust and very small impulse bit MIB [ESA Propulsion Lab]. In order to improve the thrust performance, pulsed laser plasma thrusters (LAP) became one of the major new electric propulsion because it can produce the greatest amount of impulse for a given amount of input energy, small size, very low thrust and very small impulse bit MIB. More than 100 worldwide university laboratories are focused in the field of Laser Ablation Plasma propulsion that published numerous research papers, reports and articles in the peer-reviewed literature. Several distinct thruster technologies are under continual development, but no single existing state-of-the-art micro-propulsion system is superior and suitable for arbitrary small satellite mission requirements. The quality of the ablation process for thruster applications involves novel exothermic doped polymers, where more energy is released in the form of thrust than deposited in the polymer by the incident laser pulse.

Iasi, March, 2018 S. Gurlui