International Low Temperature Plasma Community

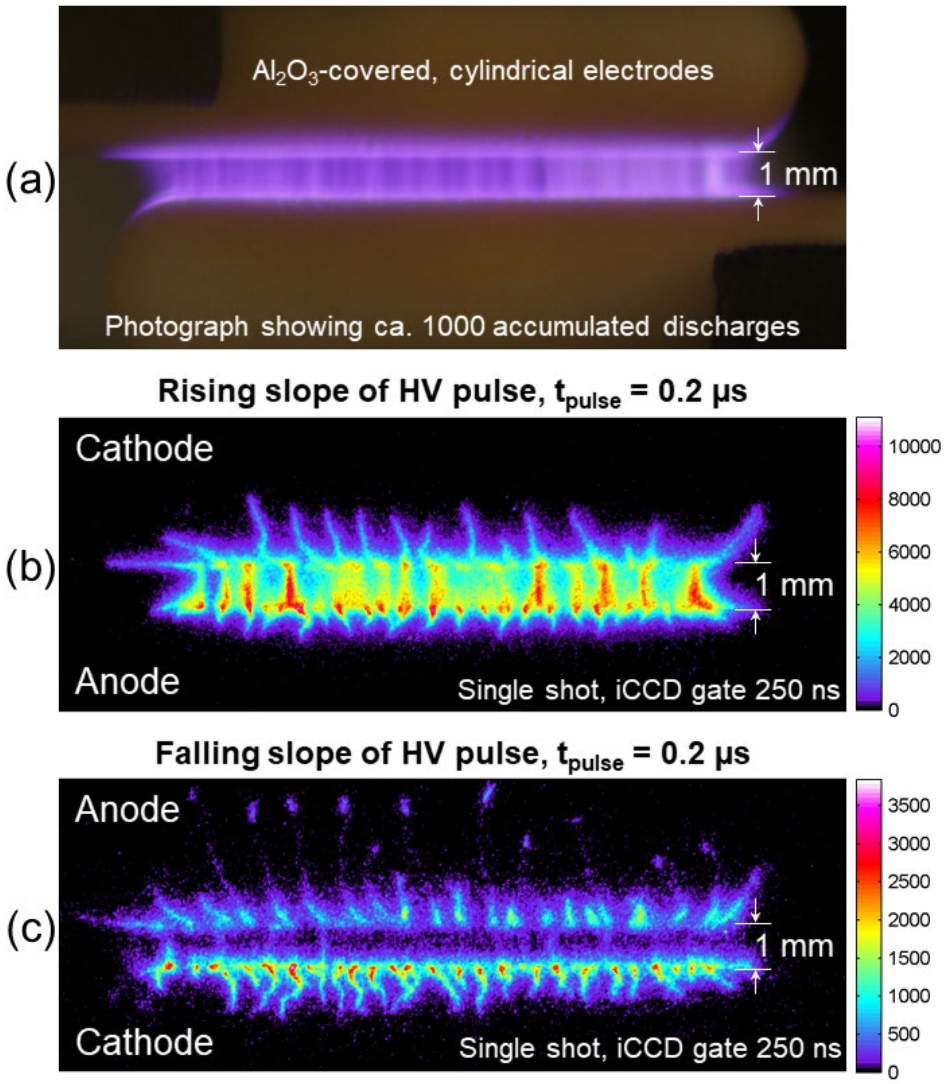
https://mipse.umich.edu/iltpc.php, iltpc-central@umich.edu

Newsletter 20

25 January 2022

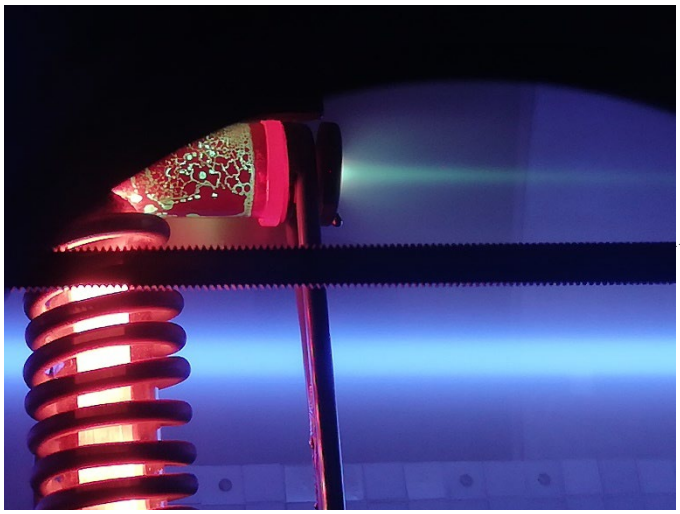
Images to Excite and Inspire!

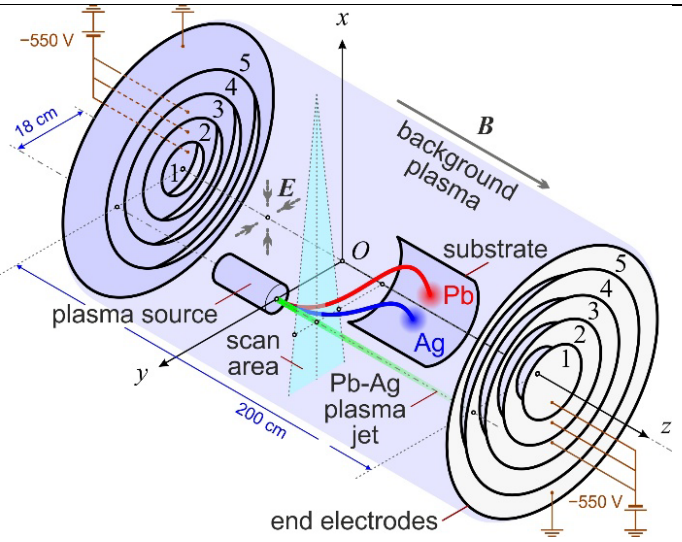
Please do send your images (with a short description) to iltpc-central@umich.edu. The recommended image format is JPG or PNG; the minimum file width is 800 px.



Dielectric barrier discharges featuring multiple filament channels along one spatial axis were ignited in a 1-mm gap in 0.1 vol% O_2 in N_2 at atmospheric pressure (a) using an unipolar positive 10-kV pulse at 10 kHz. With the rising slope of the 0.2 µs wide pulse, there are about 14 channels in the gap volume (b). However, during the falling slope there are no channels crossing the gap (c), while the surface discharges extend much further on the cylindrical alumina-covered surface. For certain conditions, the discharge characteristics found in a single-filament arrangement can be directly scaled with the number of discharge channels. Preionization induced by asymmetric voltage pulses effects breakdown occurring in a multi-filament arrangement in the same manner as single-filament DBDs. Methods for discharge control by adjusting the HV pulse duration found for single-filament DBDs can be transferred to pulsed-operated multi-filament DBD arrangements.

Contact: **Dr. Hans Höft,** Leibniz Institute for Plasma Science and Technology (INP Greifswald), hans.hoeft@inp-greifswald.de





Plasma mass separation in configuration with potential well: For the separation of chemical elements by mass, a configuration with a potential well on the axis of the cylindrical plasma system is used. In this configuration, two discharges operate simultaneously in one volume. The background discharge fills most of the vacuum chamber volume (characteristic parameters: current 10-20 A, voltage 400-600 V). Plasma source of a Ag-Pb mixture (current 30-150 A, voltage 10-25 V, ion current behind the anode 2.5 A) inject the ions at the periphery of the background plasma. The radial electric field of the background plasma entrains the plasma jet of the separated substance in the direction transverse to the magnetic field, which leads to the separation of the beam by masses. The image shows a bright blue column of the background plasma and plasma source of the Ag-Pb mixture. *Contact:* **Dr. Gennadii Liziakin,** Joint Institute for High Temperatures of RAS, Russia, gliziakin@jiht.ru.

In this issue:

Call for Contributions

Please submit content for the next issue of the Newsletter. Please send your contributions to iltpc-central@umich.edu by **March 4, 2022.**

Please send contributions as MS-Word files if possible – and **avoid sending contributions as PDF files**.

In particular, please send **Research Highlights and Breakthroughs** using this ***template:*** https://mipse.umich.edu/iltpc/highlight_template_v05.docx. The highlight consists of an image and up to 200 words of text; please also send your image as a separate file (the recommended image format is JPG or PNG; the minimum file width is 800 px). The topic can be anything you want - a recently published work, a new unpublished result, a proposed new area of research, company successes, anything LTP-related. Please see the *Research Highlights and Breakthroughs* for examples.

LTP Perspectives: Policy, Opportunities, Challenges

Two-Sided Perspectives: We are an intellectually diverse community with many opinions and many perspectives. The very important issues we face as a scientific community are not easily summarized by a single opinion or perspective. In this issue, we have the first of a periodic series called the "Two-Sided Perspectives". Here we invite two leaders of the LTP field to provide their perspective on an important issue.

Please send suggestions for future topics for the *Two-Sided Perspectives* to iltpc-central@umich.edu. Please also feel free to suggest a colleague to provide one of the perspectives.

Does the LTP Community Need to Continuously Reinvent Itself?

Perspective 1: Prof. Mounir Laroussi, Old Dominion University, USA**,** mlarouss@odu.edu

In a recent discussion, Prof. Masaru Hori of Nagoya University mentioned that a wind of change is blowing on Japan's plasma research community and big scale experiments will soon need to diversify. He compared the process to what happened to the dinosaurs and the wind of change to the meteor that caused their extinction. This analogy resonated with me and got me thinking along those terms about what did happen to the US plasma research community in the early 1990s.

Since the 1950s, in the United States, plasma research for civilian applications was dominated by works that aimed to achieve affordable fusion power plants for the production of long-lasting electrical energy. However, by the late 1980s it became clear that the goal to achieve a viable fusion reactor to produce electricity was an extremely difficult proposition and some of the challenges, especially in materials and in the control of plasma instabilities, seemed almost insurmountable. This was a devastating prognosis for the US fusion research community, which was followed by a sharp decrease in funding, causing the shutdown of many experimental reactors…and just like that, out went the dinosaurs (not all, thank goodness). But out of nowhere emerged a plethora of small-scale plasma devices, just like the emergence of the small mammals that outlived the dinosaurs and thrived. These plasma sources, mostly of the low temperature type, were versatile, easy to build, and low cost when compared to the tens to hundreds of millions of dollars needed to build large fusion reactors. Because of their practicality, these plasma sources found their way to so many technological domains ranging from lighting, to environmental, to biomedical, to surface processing.

Sometimes size does matter, as is the case for fusion reactors, but not always. I imagine that when dinosaurs saw small mammals running around, they must have thought these miniature creatures had no chance to survive in a dinosaur-dominated world. Similarly, if the LTP community does not continue to evolve and innovate it will someday experience the same fate as that of the dinosaurs. This feeling is based on the fact that most LTP sources and their performance have not changed much since the late 1990s, but there is light at the end of the tunnel: In my opinion, the recent introduction of advanced control techniques that incorporate artificial intelligence (AI), and machine learning (ML) is going to make a huge difference and save the future of both the dinosaurs and the mammals of plasma science.

Perspective 2: Prof. Luís L. Alves, Instituto Superior Técnico, Portugal, llalves@ist.utl.pt

Why should the LTP community reinvent itself in a regular way? Is the community adopting this attitude? With what purpose?

Some would argue that the 'reinvention' is needed to keep our discipline in the agenda of the funding agencies, which requires identifying and proposing 'new' application-driven subjects every five years or so. But we should not confuse mere tactical arguments, aimed at solving concrete problems such as that of sustained funding, with a strategy for evolution. If the LTP community were to adopt periodic reinvention as an evolutionary goal, then its path would become that of survival rather than that of thriving.

Shaping the future of LTP as a scientific domain requires a community effort to strengthen our identity and promoting the relevance of our findings. Regular contributions to specific LTP journals and a continued attendance to major conferences in the field are excellent contributions for achieving these goals. These forums act as international hubs to discuss LTP science and to identify new research avenues, often leading to innovative technology at the intersect with other disciplines.

The technological outcomes can (should?) be periodically revisited, according to trends and needs of the society at large. But this does not entail redefining the scientific domain of LTP, namely to move closer to other fields (electronics, chemistry, materials science, biology, medicine, agriculture, …). Rather, this requires leveraging the well-grounded science of LTP to promote cross-disciplinary approaches that facilitate successful applications. Our proximity to other domains can be used as an opportunity to identify new challenges, but should not contribute to mischaracterising our domain, nor to confusing technological advances with the underlying plasma-based science.

Indeed, the scientific foundations of LTP (namely gas discharges, gaseous electronics, plasma chemistry in homogeneous and heterogeneous phases) will always underpin research in this area, regardless all moves towards a continuous reinvention of LTP. Ultimately, these scientific foundations constitute the heritage of knowledge that the LTP community has the responsibility to impart while training the next generations, in order to perpetuate scientific domain.

This perspective resulted, in part, from reflection among the LTP members (V. Guerra, T. Silva, M. Lino da Silva) or the Department of Physics of Instituto Superior Técnico, Lisbon, Portugal.

Leaders of the LTP Community: Career Profiles

Prof. Izumi Murakami – At the Leading Edge of AMO for Plasma Physics

Prof. Izumi Murakami, one of the leading scientists in atomic and molecular database development for plasma science and applications, received the Bachelor of Science degree in physics from Kyoto University in 1986. She moved to the Department of Astronomy, the University of Tokyo for her graduate course, and received Ph. D. in 1992 from the University of Tokyo. The topic of her thesis was the evolution of primordial gas clouds with a mass of dwarf galaxies scale observed at the early universe at Theoretical Astrophysical Division, National Astronomical Observatory of Japan (NAOJ).

Izumi started her research into atomic and molecular processes in plasmas at the National Institute for Fusion Science (NIFS) in 1995. In addition to her work on atomic data evaluation and spectral modeling of impurity ions in fusion plasmas, she extensively worked to rebuild the NIFS Atomic and Molecular Databases. The new database system has been opened at http://dbshino.nifs.ac.jp/ since 1997. It originally mainly contained sub-databases for electron-impact ionization and excitation cross sections for atoms and atomic ions (AMDIS ION and EXC), charge exchange cross sections of atom-ion collisions (CHART), sputtering yields (SPUTY), and back-scattering coefficients (BACKS). She continuously worked on the database to extend the categories and to be more user-friendly. AMDIS-REC for recombination rate coefficients of atomic ions, AMOL for electron-impact cross sections and rate coefficients of molecules, and CMOL for heavy-particle collision cross sections and rate coefficients for molecules have been added since 1998. Izumi has also been closely collaborating with leading researchers in atomic and plasma physics to evaluate and produce relevant atomic data, including Profs. Ratko Janev, Yukikazu Itikawa and Takako Kato.

Recently, Izumi is engaged in collisional-radiative (CR) model developments for high-Z element ions such as tungsten and lanthanide to understand extreme ultraviolet (EUV) spectra observed in Large Helical Device (LHD) and compact electron beam ion trap (CoBIT) plasmas and to apply it for fusion plasma diagnostics and EUV lithography development.

Due to her outstanding achievements in this field, she was invited as an editor and an author of *Handbook of Atomic and Molecular Processes in Plasmas* (2011 Osaka University Press, in Japanese). The handbook contains basic atomic physics, collisional-radiative models, radiation transport, and its applications to atmospheric, astronomical, fusion, laser induced, process, and environmental plasmas, and a summary of available databases to facilitate usage of the atomic and molecular data for plasma research. In order to make communications between atomic and molecular data producers and users smoother and more effective, she launched the NPO corporation *The Forum for Atomic and Molecular Data and Their Applications* with her colleagues in 2010.

Izumi is at the center of the plasma science and atomic collision research community, and also plays a central role in collaborative research between astronomy and fusion plasma science in Japan. Thus, she is regularly invited to the Data Center Network meetings organized by IAEA Atomic and Molecular Data Unit since 2009 to represent research activities in Japan regarding atomic and molecular database developments for fusion plasma research. I think that this kind of service is done because of not only her outstanding expertise but also her kind and reliable personality.

Dr. Daiji Kato
National Institute for Fusion Science, Japan
kato.daiji@nifs.ac.jp

General Interest Announcements

- **2022 EPS Plasma Innovation Prize – Call for Nominations**

  The Plasma Physics Division of the European Physical Society (EPS) is seeking nominations for the "2022 EPS Plasma Physics Innovation Prize".

  The EPS Innovation Prize was established in 2008 in order to recognize and promote the wider benefits to society that arise from the applications of plasma physics research. The works recognized by the Prize in previous years are diverse. Nominations are welcome from all areas of technology, industry, society or more. Recent awards have included applications in medicine and materials processing.

  The prize is awarded for proven applications that can go beyond, but are derived from, plasma physics research. Joint Innovation Prizes are also possible and can be awarded to a group of up to three individuals.

  The deadline for the next round of nominations for the 2022 EPS Plasma Physics Innovation Prize is **February 1, 2022**.

  Details can be found here: http://plasma.ciemat.es/eps/awards/innovation-award/

  Contact:
  Prof. Thomas Mussenbrock
  Ruhr University Bochum, Germany
  thomas.mussenbrock@rub.de

Meetings and Online Seminars

- **International E × B Plasma Workshop**

  We are pleased to announce the next edition of the **International E × B Plasma Workshop**, organized by Universidad Carlos III de Madrid in **February 16-18, 2022**. The meeting will be finally **fully online and free of charge to the attendees**.

  The Workshop brings together researchers and experts from the plasma physics community, and is divided into **6 topical sessions**, reviewing recent developments and outlining next steps in the theoretical, numerical, and experimental research of plasma turbulence, instabilities, oscillations, transport, wall-plasma interaction, and plasma expansions. In each session we **encourage attendees to engage** in a fruitful discussion with the panel.

  Workshop agenda, registration form, and additional information are available at exbworkshop.ep2.uc3m.es.

  Contact:
  Prof. Mario Merino
  Universidad Carlos III de Madrid, Spain
  mario.merino@uc3m.es

- **Joint OLTP and IOPS Online Seminars**

The *Online Low Temperature Plasma* (OLTP) seminar series and the *International Online Plasma Seminar* (IOPS) are in the process of merging the two-seminar series into a single series with the tentative name of *Online Plasma Science Seminar* (OPSS). The OPSS will be managed by the Gaseous Electronic Conference (GEC). This merger, anticipated to occur in July 2022 will enable better coordination and ultimately bigger impact.

Until the merger becomes official, OLTP and IOPS are continuing to offer their own online seminars.

- The program of the OLTP (and links to past seminars) can be found at: https://theory.pppl.gov/news/seminars.php?scid=17&n=oltp-seminar-series
- The program of the IOPS (and links to past seminars) can be found at: http://www.apsgec.org/main/iops.php.

In anticipation of the merger, OLTP and IOPS are jointly organizing a special series of online seminars. Login information for the seminars can be found on either website. These jointly organized seminars are:

Date	*Speakers*	*Title*
31-Mar-2022 11:00 am US Eastern Time	Trevor Lafleur ThrustMe, Australia	Characterization of a radio-frequency inductively coupled electrothermal plasma thruster
	Dmytro Rafalsky ThrustMe, France	In-orbit demonstration of an iodine electric propulsion system
17-Mar-22 11:00 am US Eastern Time	Vandana Miller Drexel University, USA	Plasma oncology
8-Mar-22 9:00 am US Eastern Time	Jean-Pierre Boeuf LAPLACE, Toulouse, France	What LTP community needs to know about EXB discharges
11-Jan-22 9:00 am US Eastern Time	Valery Godyak RF Plasma Consulting, University of Michigan, USA	Classical Langmuir probe diagnostics: Validity, problems and their resolution (See website for recording)

Contacts:
Dr. Anne Bourdon and **Dr. Igor Kaganovich**, OLTP Co-Chairs
Dr. Kallol Bera, IOPS Chair
anne.bourdon@lpp.polytechnique.fr, ikaganov@pppl.gov, kallol_bera@amat.com

- **5th International Symposium on Plasmas for Catalysis and Energy Materials (ISPCEM)**

  We are very pleased to welcome you to the 5th International Symposium on Plasmas for Catalysis and Energy Materials (ISPCEM), which will be organised in a hybrid mode in Liverpool (UK) on July 3-7, 2022.

  https://ispcem.com

  If you would like to attend, please register your interest using the following link:

  https://forms.office.com/r/AAfY1WeWcU

  This will help us estimate the number of participants.

  Contact:
  Prof. Xin Tu
  University of Liverpool, UK
  xin.tu@liverpool.ac.uk

- **GD 2022 - Abstract Submission Deadline Extended to 1st February 2022**

  We are pleased to invite you to participate in the 23rd International Conference on Gas Discharges and their Applications (GD2022), which will be held on-site in Greifswald, Germany, from 28th August to 2nd September 2022.

  The GD 2022 will be organized jointly by the Leibniz Institute for Plasma Science and Technology (INP), the Max Planck Institute for Plasma Physics and the Institute of Physics at the University of Greifswald. The conference explores all kinds of gas discharges, ranging from low pressure to high-pressure plasmas, from thermal to non-thermal plasmas and their applications, such as pulsed-power technology, light sources, switchgear, environmental and medical applications.

  For more details and the abstract template, please visit our website: www.gd2022.org.

  We are looking forward to your participation!

  Contact:
  Dr. K.-D. Weltmann, Chair, Local Organizing Committee
  Leibniz Institute for Plasma Science and Technology
  weltmann@inp-greifswald.de

Community Initiatives and Special Issues

Please submit your announcement for Community Initiatives and Special Issues to iltpc-central@umich.edu.

Surface Charging Memory Effect Demonstrated in Pulsed Helium Plasma Jet-target Interaction

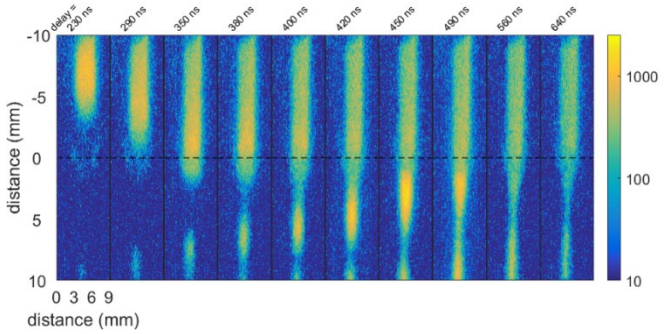


Figure 1. Experimentally-obtained imaging of light emission at different instants during discharge propagation and interaction with a dielectric BSO target, for a pulse of 1 µs length and -5 kV amplitude. The horizontal dashed line (distance=0) corresponds to the end of the dielectric tube. The target is placed at a 10 mm distance. Besides the ionization wave propagating towards the target, a discharge is ignited on the target surface and a reconnection between the two discharges takes place.

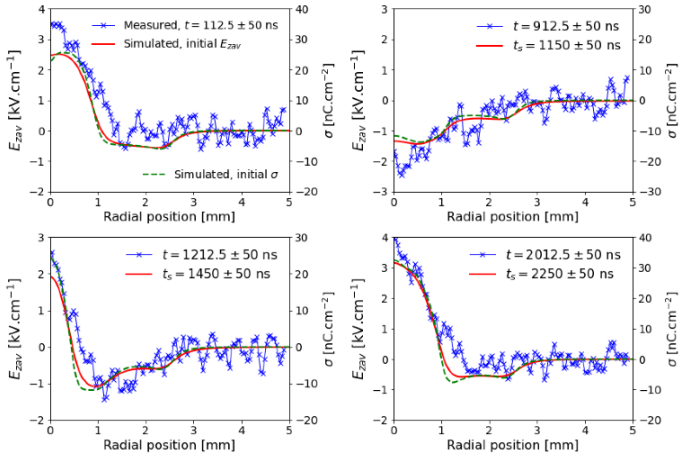


Figure 2. Radial profiles at different instants of the axial component of electric field inside a dielectric BSO target (E_{zav}, solid lines) from simulations and measurements, and of the simulated surface charge density (σ, dashed lines) on the target surface, for the same pulse of applied voltage as in figure 1. t refers to the instant in time in experiments and t_s to the instant in time in simulations. Positive E_{zav} and σ remain in the target in between pulses.

The existence of memory effects, i.e. leftover charges and reactive species that influence subsequent discharges, has long been assumed to have a crucial importance in the operation of DBDs. Memory effects can be present in the gas phase volume or on dielectric surfaces. In this work, a surface charging memory effect is demonstrated and quantified, by both directly measuring and simulating the spatial distribution of electric field inside a dielectric target impinged by pulsed helium plasma jets of different polarities.

This memory effect consists in a significant amount of surface charges and electric field remaining in the target in between discharge pulses (200 µs off-time). The memory effect is especially important when using negative electric polarity. In that case, counter-intuitively, the target remains positively charged in between pulses. This is shown to directly impact the ionization wave dynamics, as the surface charges lead to the ignition of a second discharge on top of the target as the ionization wave approaches it. The reasons for the lack of target neutralization and the remainder of surface charges are investigated.

Contacts:
Dr. Pedro Viegas
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Dr. Elmar Slikboer
The University of Liverpool, Liverpool, United Kingdom
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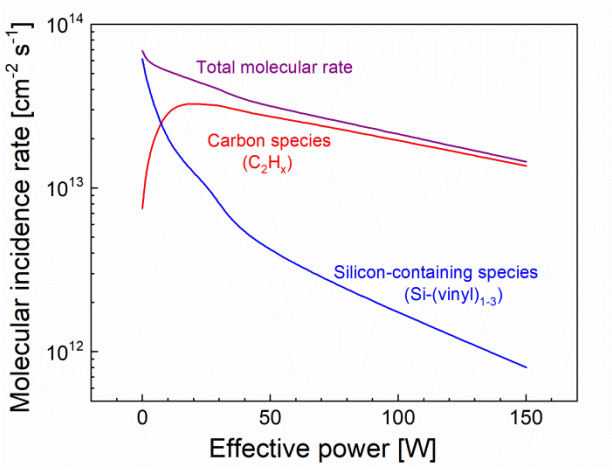
Source:
P. Viegas, E. Slikboer, Z. Bonaventura, E. Garcia-Caurel, O. Guaitella, A. Sobota and A. Bourdon, Quantification of surface charging memory effect in ionization wave dynamics,
Scientific Reports **12**, 1181 (2022).
https://doi.org/10.1038/s41598-022-04914-8,
www.nature.com/articles/s41598-022-04914-8

Nonthermal Tetravinylsilane Plasma Used for Thin-film Deposition: Plasma Chemistry Controls Thin-film Chemistry



Molecular incidence rate of silicon-containing species and carbon species depending on effective power.

Neutral species in a nonthermal tetravinylsilane pulsed plasma owith an effective power of 2 – 150 W were investigated by mass spectrometry. The mass spectra contained many tens of peaks that were assigned to cations of different reactivity. It was found that the concentrations of hydrogen and methyl in the deposited films are proportional to the production of cations of hydrogen and methane molecules as by-products recorded in the mass spectrometer. The interpretation of the mass spectrum was based on the idea that the most produced (dominant) species in the plasma reactor (deposition chamber) are responsible for the elemental composition and chemical structure of the deposited film. The power-driven concentrations of the species in the plasma reactor were expected to be reflected in the corresponding concentration of the respective cation in the mass spectrometer due to similar fragmentation patterns for electron impact dissociation and dissociative electron impact ionization. These assumptions made it possible to identify the main building blocks for film growth and to elucidate the cause of the relatively complex course of the deposition rate as a function of the effective power.

It has been found that when distinct sticking coefficients for the dominant carbon and silicon-containing species are included, the deposition rate correlates with the effective molecular incidence rate, which was calculated based on the partial pressure of these species in the mass spectrometer. The strong correlation between the C/Si ratio, vinyl and C=C concentrations in deposited films and fluxes of chemisorbed plasma species confirms some relationship between plasma chemistry and thin-film chemistry. Although ionic processes also provide neutral species, electron impact dissociation of precursor molecules, along with chemical processes on the film surface, has been evaluated as the most important processes for the formation of neutral building blocks responsible for film growth.

Contact:
Dr. Vladimir Cech
Brno University of Technology, Czech Republic
cech@fch.vut.cz

Source:
V. Cech, M. Branecky, Plasma Processes Polym. 2021, e2100192.
https://doi.org/10.1002/ppap.202100192

New Resources

Please submit your announcement for New Resources to iltpc-central@umich.edu.

Career Opportunities

- **Post-doctoral Research Fellow, Computational Low Temperature Plasmas, University of Michigan, USA**

  A post-doctoral research fellow (PDRF) position in computational low temperature plasmas (LTPs) is available in the research group of Prof. Mark J. Kushner at the University of Michigan, Ann Arbor, MI USA. The position entails development and application of computer models for low temperature plasmas, plasma chemistry and plasma surface interactions; and nano-scale modeling of surface evolution. The PDRF may work on several projects, examples being:

  - Atmospheric pressure plasma transport, plasma chemistry and sources.
  - Atmospheric pressure plasmas interacting with complex surfaces, liquids, biological materials, and electrochemical solutions.
  - Low pressure plasma transport and chemistry in inductively coupled, microwave and capacitively coupled plasmas.
  - Plasma surface interactions for materials process.
  - Profile evolution for microelectronics fabrication.

  The PDRF should have the following skill-sets:

  - Expertise in the fundamental processes of LTPs, plasma chemistry and plasma surface interactions.
  - Expertise in developing and maintaining parallel computer models for LTPs using high level languages.
  - Excellent oral and written communication skills.
  - Ability and desire to supervise graduate students; and interact with research colleagues in academia, national laboratories and industry.

  More information about the research group is at: https://uigelz.eecs.umich.edu.

  The initial appointment period is 1 year with reappointment for 2 or 3 years subject to performance and availability of funds. The position is available immediately and requires in-person presence in Ann Arbor, Michigan. (The position is not available remotely.)

  Applicants should send a cover letter (including date applicant is available), CV, reprints of representative publications and contact information for 3 references to **Prof. Kushner** (mjkush@umich.edu).

  Contact:
  Prof. Mark J. Kushner
  University of Michigan, USA
  mjkush@umich.edu

- **New Technologies for Plasma Cosmetic Surgery, Apyx Medical, Florida, USA**

  About the company: Apyx Medical (https://apyxmedical.com/) is a plasma technology company focused on developing innovative medical devices. Known for our Renuvion and J-Plasma technologies, we are currently seeing incredible growth for our products in the cosmetic surgery market. Apyx Medical headquarters is located in Clearwater, Florida USA. This role will require relocation to the Tampa Bay area.

Summary of the role: This role is responsible for the evaluation and development of new technology for the business. This is a key role for the company, providing scientific expertise and building a pipeline of fully vetted concepts for eventual transfer to product development teams for commercialization. The focus in the beginning will be on Cold Atmospheric Plasma. The role can be hired at the Senior/Principal Scientist, or Manager level, depending on the skillset and previous experience of the candidate.

Essential duties:

- Manage and conduct all pre-clinical research activities for evaluation of new technology and further scientific understanding of current products.
- Design and execute bench top experiments in-house and with outside test labs.
- Work directly with clinicians to establish robust research protocols and to solicit feedback on new technology.
- Draft pre-clinical research protocols and reports.
- Facilitate publication of pre-clinical research data in peer-reviewed journal articles.

Requirements and preferred qualities:

- MS degree in Science or Engineering required.
- PhD in Science or Engineering preferred.
- Previous experience in cold atmospheric plasma applications is highly preferred.
- Previous early-stage medical technology development experience in industry or academia is required.

How to apply: Send your resume to Apyx Medical HR department at: HR@ApyxMedical.com.

Contact:
Dr. Fredrik Jonsson
Apyx Medical, USA
Fredrik.Jonsson@ApyxMedical.com

- **Graduate Student and Post-doctoral Positions in Laser Diagnostics of Plasmas, Department of Mechanical Engineering, Colorado State University, USA**

A main objective of our research group is to develop and implement laser diagnostic methods to advance research on electric propulsion plasma thrusters (e.g., ion and Hall thrusters) used for satellites and space exploration. As part of the NASA center, Joint Advanced Propulsion Institute (JANUS), we are developing Cavity-Ring Down Spectroscopy (CRDS) to study thruster sputtering and erosion, and Two Photon Absorption Laser Induced Fluorescence (TALIF) to study densities of neutral atoms to examine facility effects. We also have ongoing project on: 1) laser induced plasmas and their use for combustion ignition, 2) laser diagnostics (Thomson scattering) to measure plasmas within high-power switches for Sandia National Laboratory, and 3) clean-room monitoring technology, for gas-phase species and particles, based on CRDS techniques. We have openings for both graduate students (MSc/PhD) and post-doctoral researchers for these projects.

Further information about our research group – the Center for Laser Sensing and Diagnostics - can be found on our group's webpage: https://www.engr.colostate.edu/laboratories/clsd/. We are located at the Powerhouse Energy Campus at CSU and EP projects are performed collaboratively with CSU's Electric Propulsion and Plasma Engineering Group: http://www.engr.colostate.edu/ionstand/index.php.

Contact:
Prof. Azer Yalin
Department of Mechanical Engineering, Colorado State University, USA
azer.yalin@colostate.edu
970-232-5545

- **The PLASyntH2 Project: Plasma-based H_2 Synthesis from Hydrocarbons, Belgium Universities**

The *PLASyntH2* project granted in the framework of the Belgian Excellence of Science (EOS) program of FWO-FNRS is looking for 10 PhD students and 4 post-docs in the field of plasma chemistry, plasma technology or plasma physics.

Plasma-based H_2 synthesis from hydrocarbons is an interesting complementary approach to water electrolysis, because it also uses renewable electricity and has no CO_2 emission, and in addition, it can valorize CH_4 and plastic waste, generate high value C-materials as side-product, and is thermodynamically more favorable. However, before exploiting this application, it is crucial to gain a better fundamental understanding of the plasma processes. This is exactly addressed in our project. We will perform green H_2 synthesis experiments from various hydrocarbons and in several plasma types, in gas-phase and in contact with liquids, and develop a multi-diagnostics platform for time- and spatially-resolved characterization, as well as novel multi-dimensional, multi-scale models, to study the underlying mechanisms in all plasma systems. The project will lay the basis for green H_2 synthesis by plasmas and will open up a new area in the field of plastic waste recycling. This project is a collaboration between the following PI's and universities in Belgium:

- Annemie Bogaerts, Coordinator – Antwerp University (www.uantwerpen.be/plasmant)
- Nathalie De Geyter – Ghent University (www.ugent.be/ea/appliedphysics/en)
- Rino Morent – Ghent University (www.ugent.be/ea/appliedphysics/en)
- François Reniers – Université Libre de Bruxelles (http://chemsin.ulb.be//)
- Rony Snyders – University of Mons (https://chips.umons.ac.be/index.php/fr/)

We offer to PhD students:

- A full-time (100%) PhD student position as bursary (very competitive salary). The scholarship is initially offered for a period of one year and will be renewed up-to four years upon positive evaluation.
- All PhD students will work in two of the above-mentioned research groups, co-supervised by 2 PI's, and will obtain a joint or double PhD diploma.

We offer to post-doctoral fellows:

- A full-time position, initially offered for one year, but it could be renewed up to maximum four years upon positive evaluation.

Envisaged starting dates: As soon as possible.

How to apply: Applications must contain the following documents in English:

- Personal (motivation) letter
- Curriculum vitae (an official proof of English language skills is an added value)
- List of publications (if available)
- Transcripts of B.Sc. and M.Sc. courses and grades
- Copy of your diplomas (if already available)
- Indication of your preference for experiments or modelling or a combination of both
- Indication of your preference of university/research group where you want to apply (see websites above); PhD students should indicate two research groups or their preferred research topics

The requested documents should be sent to **Prof. dr. Annemie Bogaerts** (PLASyntH2@uantwerpen.be) before **February 28th, 2022**, entering as subject of your mail: PLASyntH2_your name

Contact:
Prof. Annemie Bogaerts
University of Antwerp, Belgium
annemie.bogaerts@uantwerpen.be

- **EUV Scientist/Experimentalist, ASML, San Diego, USA**

  ASML has a unique and exciting opportunity for a EUV Staff Systems Scientist to join a dynamic and innovative Technology Development team, focused on conceiving and demonstrating the technologies required for next generations of high-power extreme ultraviolet (EUV) light sources. The EUV source technology development team is responsible for identifying system-level operating points for stable EUV production from laser produced plasmas and helps to chart the path to higher average EUV powers to meet the future needs of the EUV roadmap. Based on a laser produced plasma (LPP), our light source relies on a wide range of unique and challenging technologies, ranging from laser light amplification and high-power optical systems to laser produced plasma for EUV generation, electro-optical signal detection and algorithm-based actuation for process control. You are invited to bring your passion, knowledge and expertise in areas of applied physics, plasmas, metrology, optics, controls, lasers, and experiment design to push the boundaries of these technologies forward.

  More information and application procedures are at:
  https://www.asml.com/en/careers/find-your-job/3/2/4/euv-staff-systems-scientist-req32423

  Contact:

  Dr. Michael Purvis
  ASML, Inc., USA
  Michael.purvis@asml.com

- **Post-doctoral Position in Plasma Processes & Nanomaterial Synthesis, Ulster University, UK**

  A post-doc position for up to 2.5 years (30 months) is available on "Plasma Processes for Nanomaterials Synthesis" in the research group of Prof. Davide Mariotti at Ulster University, UK (https://pure.ulster.ac.uk/en/persons/davide-mariotti).

  The application deadline is **28th of January 2022**.

  The post holder will undertake leading research on plasmas processes and advanced materials for applications with a strong focus on developing new understanding of relevant scientific principles and technologies. The ultimate aim is to obtain a fundamental understanding of plasma mechanisms and processes and the formation mechanisms of nanoparticles.

  Applicants with strong interest and background experience in plasma processes (either at low-pressure or at atmospheric pressure) and diagnostics are also strongly encouraged to apply. Experience in nanomaterial synthesis is a benefit but not necessary.

  You can find details of the application procedure and job specifications at:

  https://my.corehr.com/pls/coreportal_ulsp/erq_jobspec_version_4.display_form?p_company=1&p_internal_external=E&p_display_in_irish=N&p_applicant_no=&p_recruitment_id=010062&p_process_type=&p_form_profile_detail=&p_display_apply_ind=Y&p_refresh_search=Y
  Contact:
  Prof. Davide Mariotti
  Ulster University, UK
  d.mariotti@ulster.ac.uk

- **Post-doctoral Position, Department of Chemical and Biomolecular Engineering, Clarkson University, Potsdam, NY USA**

  A post-doc position is available at Clarkson University to study the use of an enhanced contact electrical discharge plasma reactor to treat poly- and perfluoroalkyl substance (PFAS) contaminated groundwater and other aqueous streams. A highly motivated individual is sought with hands-on experience in plasma reactor design and other advanced oxidation processes and reaction engineering. Knowledge of reactor design and optimization, high voltage engineering, equipment troubleshooting, experimental data analysis and analytical chemistry are desired. The position will last up to three years contingent on funding.

  Minimum qualifications: All applicants must have an advanced degree in chemical engineering, electrical engineering, mechanical engineering, environmental engineering, or a closely related field to be considered. A PhD is required.

  Preferred qualifications: Applicants with a demonstrated hands-on experience in the use of plasma technology and other advanced oxidation processes to remove contaminants from water will be given priority.

  Contact:
  Dr. Selma Mededovic Thagard
  Clarkson University, USA
  smededov@clarkson.edu

- **Post-doctoral Position, Laboratory for Plasma Physics, École Polytechnique, Paris, France**

  École Polytechnique (https://www.polytechnique.edu) is a leading French technical school which combines top-level research, academics, and innovation at the cutting edge of science and technology. The École Polytechnique Research Center includes 23 laboratories in physics, biology, chemistry, computer science, economics, mathematics, applied mathematics and mechanics.

  The Laboratory of Plasma Physics (https://www.lpp.polytechnique.fr) located at École Polytechnique has the possibility of hosting a EuroTech PostDoc fellow (https://postdoc2.eurotech-universities.eu/). The deadline for the application is **February 24, 2022**.

  Possible scientific directions include: kinetics of nanosecond discharges, plasma-assisted, combustion, advanced laser diagnostics, plasma-assisted CO_2 conversion, plasma-assisted cell biology.

  The fellowship is a collaborative project between two Universities - EuroTech partners. The collaboration can take place in the form of short visits and virtual tools (web conferences). The EuroTech Partners of École Polytchnique are: Technical University of Denmark – DTU, École Polytechnique Fédérale de Lausanne – EPFL, École Polytechnique Paris – L'X, Technion Israel Institute of Technology - Technion, Eindhoven University of Technology – TU/e, and Technical University of Munich – TUM. The fellowship, if awarded, must start before February 1, 2023.

  Applicants must fulfill the following eligibility criteria:
  - they must, by the call deadline, be in possession of a doctoral degree or have at least four years of full-time equivalent research experience;
  - they may not have resided or carried out their main activity in France for more than twelve months in the three years immediately before the call deadline;
  - they must be able to carry out full time research during the fellowship period;
  - research direction should follow the H2020 Ethics rules.

  Contact:
  Dr. Svetlana Starikovskaia
  Laboratory of Plasma Physics, at Ecole Polytechnique, Paris
  svetlana.starikovskaia@lpp.polytechnique.fr

- **Dusty Plasma Diagnostics Post-doctoral Position, Mechanical and Aerospace Engineering, Princeton University, USA**

  We are looking for recent PhD graduates with a background in plasma physics for a postdoctoral position in the field of dusty plasmas to develop and apply novel methods for real-time, in situ measurements of charge on dust particles in plasma. The research involves combined application of state-of-the-art diagnostic approaches using nanosecond pulsed lasers together with traditional plasma characterization methods (probe, microwave interferometry, spectroscopy) and supported by modeling efforts.

  The position is with the Mechanical and Aerospace Engineering of Princeton University. The candidate will join the research team comprising experts in experimental and theoretical plasma physics, students and technical personal from the Princeton University and the Princeton Plasma Physics Laboratory. It is anticipated that the candidate will establish and maintain a close scientific collaboration with the team members.

  Minimum requirements:
  - Ph.D. in physics or engineering with emphasis on plasma science, plasma and gas phase diagnostics.
  - Knowledge and experience in the construction and use of traditional plasma diagnostics (e.g., microwave interferometry, probes, optical emission and absorption spectroscopy) and laser-based diagnostics.

  The post-doc position is offered for 2 years with the possibility of extension for one more year.

  Contacts:
  Dr. Mikhail Shneider, Princeton University, USA, shneyder@Princeton.edu
  Dr. Yevgeny Raitses and **Dr. Shurik Yatom**, Princeton Plasma Physics Lab, USA
  yraitses@pppl.gov, syatom@pppl.gov

Collaborative Opportunities

Please submit your notices for Collaborative Opportunities to iltpc-central@umich.edu.

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