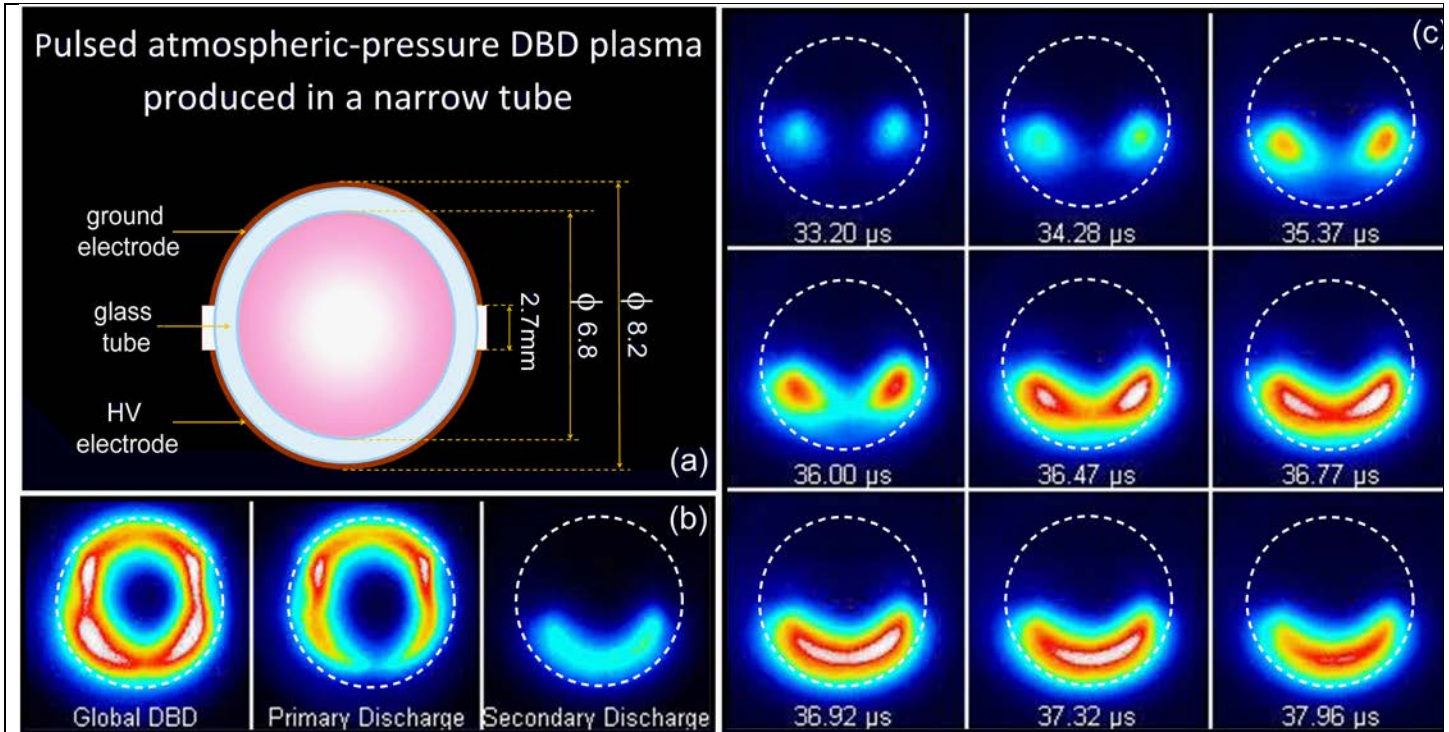
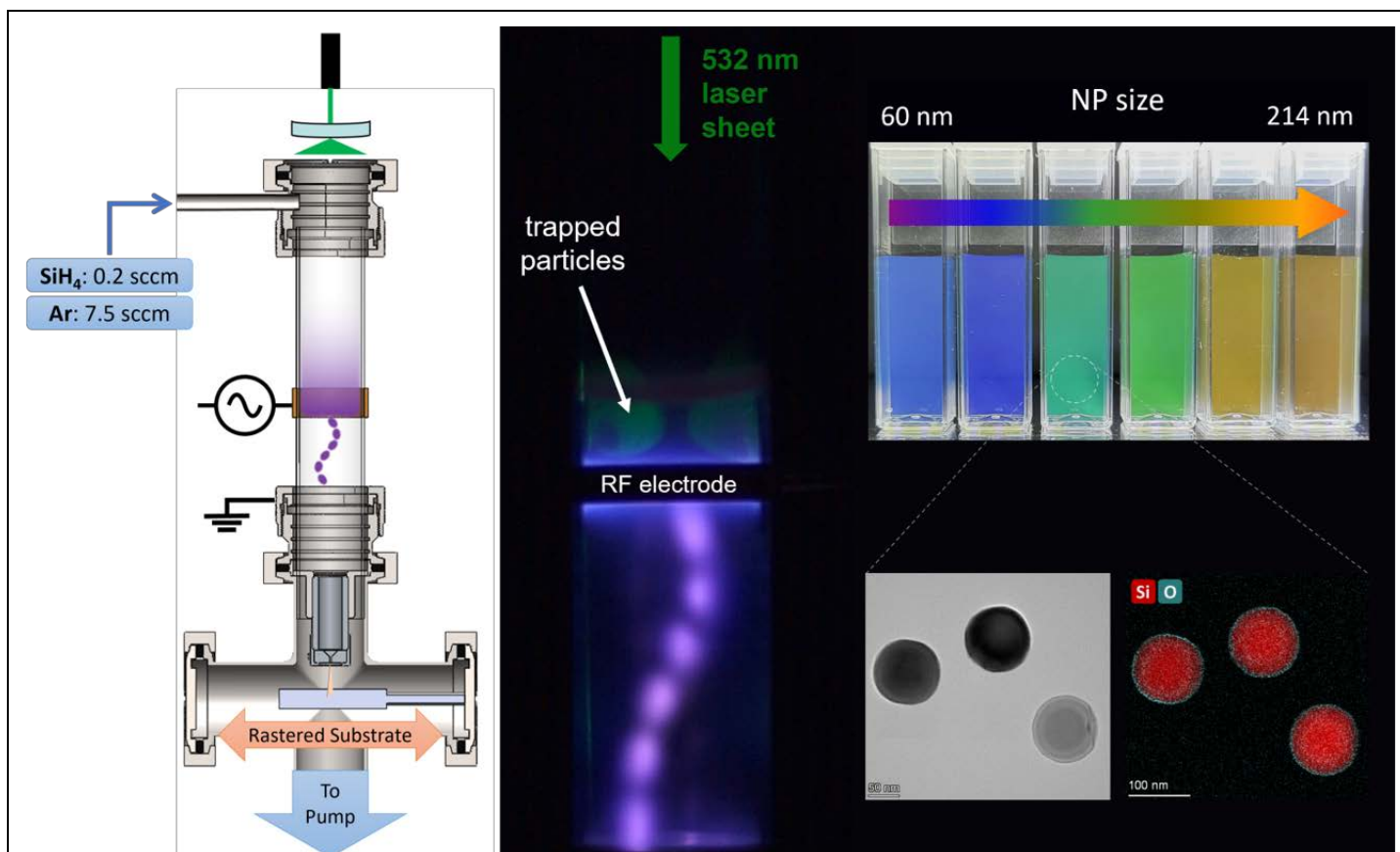


Images to Excite and Inspire!

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



Secondary DBD discharge as a plasma smile: (a) Plasma is produced in helium at atmospheric pressure inside a narrow tube by a dielectric barrier discharge (DBD) in a symmetrical configuration of external curved electrodes. Under positive voltage pulses ($\sim 40 \mu\text{s}$ width), two current peaks are observed per voltage pulse. (b) The global light emitted by the DBD is obtained when the digital camera operates in continuous mode, being temporally integrated. The images of the primary discharge (positive current pulse) and secondary discharge (negative current pulse) are taken with a camera gate given by the corresponding current pulse duration $\sim 10 \mu\text{s}$. (c) The cross-view of the light emitted at different moments during secondary discharge is shown, where $36.9 \mu\text{s}$ corresponds to the secondary discharge current maximum (considering 0 ns the moment when the primary discharge breakdowns). The shape of the light emitted by the secondary discharge suggests a “plasma smile”. **Dr. Alina Silvia Chiper**, Alexandru Ioan Cuza University of Iasi, Romania, alina.chiper@uaic.ro.



Laser light scattering of trapped silicon particles in a continuous-flow plasma reactor: Nonthermal plasma reactors with a flow-through design have long been employed for the formation of nanocrystals that are difficult or impossible to synthesize with other fabrication techniques. However, these reactors are often limited to the synthesis of small crystalline nanoparticles, typically < 10 nm in diameter, due to the short residence time of particles in the plasma. By operating a discharge at low flow rates in a relatively large 35 mm diameter reactor (left), particles can be temporarily trapped inside the reactor (middle), extending the residence time of the particles. Nanoparticle trapping is the result of the competition of different forces acting upon negatively charged particles (electrostatic, thermophoretic, and drag forces). This trapping acts as a size filter allowing small nanoparticles to grow to a critical size in the trapping zone (the region of green light scattering in the image) before being detrapped and collected (<https://doi.org/10.1088/1361-6463/ac57de>). Operating at high discharge power causes the plasma to constrict into a high-density filament. This allows for synthesis of highly crystalline and monodispersed silicon particles in the Mie-resonant size regime, 60 to 214 nm in diameter (right bottom), which show size-dependent resonant scattering when illuminated with white light (right top). **Dr. Mohammad Ali Eslamisaray** (eslam012@umn.edu) and **Prof. Uwe Kortshagen** (kortshagen@umn.edu), University of Minnesota, USA. Source: M. Eslamisaray, Nano Letters (2023). <https://doi.org/10.1021/acs.nanolett.2c05084>.

In this issue: • Images • Call for Contributions • LTP Perspectives • Leaders of the LTP Community • General Interest Announcements	• Meetings and Online Seminars • Community Initiatives, Special Issues • Research Highlights, Breakthroughs • New Resources • Career Opportunities • Collaborative Opportunities
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Call for Contributions

Please submit content for the next issue of the Newsletter. Please send your contributions to iltpc-central@umich.edu by **April 7, 2023**. 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.

Hydrogels in Plasma Medicine – Opening New Possibilities

Plasma treatment of polymers has been widely investigated for some decades, especially to enhance their hydrophilicity, their surface energy or to introduce new functional groups for subsequent processes.

Thanks to the advent of plasma devices working at atmospheric pressure, new avenues have opened in the field of Plasma Medicine - from treating solid polymers in the past, to currently employing hydrogels. In this sense, semi-solid polymers or even polymers in solution are in the limelight for plasma treatment. Hydrogels are a class of soft and elastic materials that consist of a three-dimensional network of hydrophilic polymers capable of holding large amounts of water. Their unique physical and chemical properties make them ideal for a wide range of applications, including biomedical applications, such as drug delivery and tissue engineering. In this context, the great versatility and resourcefulness of hydrogels has recently caught the attention of the scientific community.

In plasma therapies, reactive oxygen and nitrogen species (RONS) generated from plasma sources are pointed out as very important actors, and are responsible of part of the biological response to plasma and plasma treated liquids. It is therefore of interest to understand their distribution in tissues during direct treatment, as well of finding novel ways to deliver them locally when dealing with indirect plasma treatments.

Up to now, hydrogels have been explored with two main objectives of interest in the plasma medicine field. The first is employing hydrogels as surrogates of tissues to investigate the penetration depth of plasmas and distribution of RONS, or as screens for certain RONS during plasma treatment, which imply plasma treatment of gelled or crosslinked hydrogels. In this context, hydrogels can contribute to a better understanding of the interactions between plasma and biological tissues.

Second, plasma treatment of liquids has been widely investigated as transporter of RONS, as they can be injected locally in a minimally invasive approach. In this context, another area of study involves plasma treatment of biopolymers in solution. If the biopolymers are selected with ability to crosslink, they can then form hydrogels to store therapeutic RONS and deliver them to the diseased site in living tissues. Besides, the complexity of biopolymer solutions generates interesting chemistry in their interactions with plasmas, modifying reactivity with regard to conventional ionic solutions and eventually leading to organic oxidized species which might have interest.

In summary, these novel areas of research are paving the way for exciting discoveries in plasma medicine. As the field evolves, hydrogels will likely play an increasingly important role in both new therapeutic applications, as well in helping to better understand the interactions of plasmas with tissues.

Dr. Cristina Canal

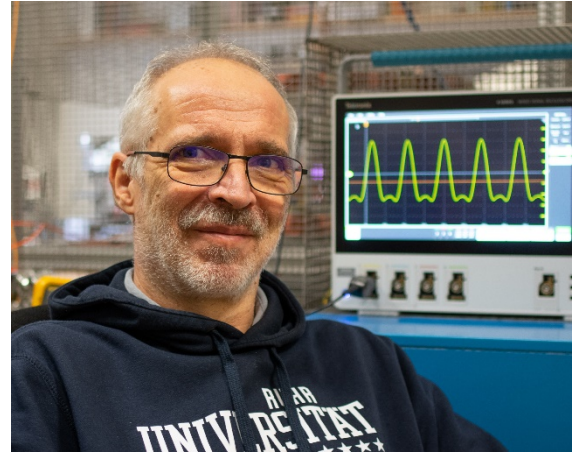
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Zoltán Donkó – Mastering both Experimental and Numerical Methods

Zoltán Donkó is a research professor at the Wigner Research Centre for Physics in Budapest, Hungary. He received his university diploma in Electrical Engineering from the Budapest University of Technology in 1989. While still a student, he started working on gas lasers at the Central Research Institute for Physics in Budapest. He received his Cand. Sc degree in 1996 and the DSc (Doctor of Science) title in 2005 from the Hungarian Academy of Sciences.

Early in his career, while investigating noble gas mixture and sputtered metal ion hollow cathode lasers experimentally, his interest has turned to the physics of their active medium, the gas discharge. Guided by this interest, he established computational electrical gas discharge research within the Laser Physics Department. This topic grew rapidly and soon became the central theme of the research group, independent of lasers. His research activities in the past decades included experimental investigations and numerical simulation studies of various types of electrical gas discharges, electron transport phenomena, as well as strongly coupled plasmas, such as dusty and Coulomb plasmas. Over the years, he has developed a zoo of simulation codes implementing different approaches like fluid, hybrid, and fully kinetic models to describe the transport and dynamics of charged particles under a wide range of conditions. These codes have been used in many fundamental studies of various phenomena in low-pressure plasmas, e.g., electron power absorption, the influence of multi-frequency excitation waveforms on discharge characteristics and control of particle properties, frequency coupling effects, the contribution of surface processes to plasma properties. His simulation work goes hand in hand with his experimental research, always looking for possible links. A recent practical result of this approach has been the construction of a series of geometrically symmetric capacitively coupled plasma sources, which allow direct comparison of experimental and numerical results. He continues to broaden his scientific horizon and has recently become involved in studies of atmospheric pressure and magnetized plasma sources as well.



In addition to his research activities, Zoltán is actively involved in the training and mentoring of students and young researchers, from high school level to post-docs. He regularly gives introductory university courses on gas discharge physics and particle-based simulations. His recent lectures are highly appreciated by students from all over the world.

Zoltán has served in the editorial board of *Plasma Sources Science and Technology* from 2017 and has been Associate Editor of the journal from 2021 to 2023. He served in the scientific committees of some of the most important conference series of his research fields. In Hungary, he participated in the organization of the Europhysics Conference on the Atomic and Molecular Physics of Ionized Gases (ESCAMPIG) in Lillafured in 2000, the Colloquium Spectroscopicum Internationale in 2009, the Strongly Coupled Coulomb Systems (SCCS) in 2011 in Budapest, and the Central European Symposium on Plasma Chemistry (CESPC) in Balatnád in 2013.

During his more than 30-year academic career, Zoltán has received several prestigious awards, including the William Crookes Prize (2010) for his contributions to the understanding of the effect of elementary processes on the properties of gas discharges and strongly coupled plasmas, the Schmid Award of the Hungarian Physical Society (1998), and the Award of the Hungarian Academy of Sciences (2017). He has been a visiting scholar at Boston College, USA, visiting professor and specially appointed professor at Osaka University, Japan, and a Mercator Fellow at Ruhr University Bochum, Germany, for several years.

Although his academic activities could fill his entire life, he is careful to balance his professional and personal life. He is a passionate and regular badminton player. Many in the LTP community have had the opportunity to play badminton with him during conferences or scientific visits. He is an enthusiastic nature photographer. Every year he devotes a few weeks to this passion, kayaking in the hidden channels of Lake Tisza and capturing the beauty of nature. About Life, the Universe and Everything, he shares much of the views of the depressed android from his favorite novel, *The Hitchhiker's Guide to the Galaxy* by Douglas Adams.

We, his former students, and current colleagues and friends, are grateful to him for inducing us to this exciting field and for his continued support in our careers.

Dr. Aranka Derzsi and Dr. Péter Hartmann

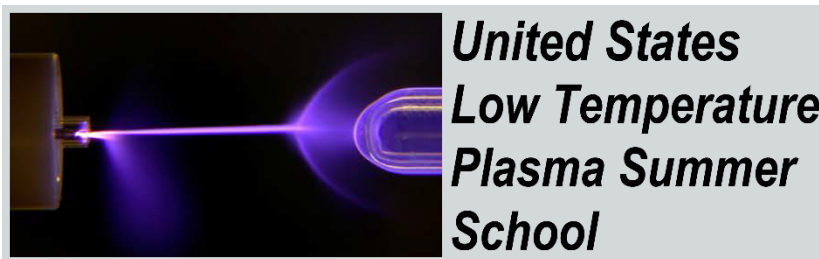
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General Interest Announcements

- **2nd US Low Temperature Plasma Summer School, June 26-30, 2023**

The 2nd United States Low Temperature Plasma Summer School (USLTPSS) will be held June 26-30, 2023, on the campus of the University of Michigan, Ann Arbor, MI, USA. The USLTPSS is intended to provide an opportunity for graduate students and researchers new to the low temperature (LTP) field to be immersed in the fundamentals and applications of LTPs for one week and to learn from leading researchers in their field. The lecturers and topics for the 2nd USLTPSS are listed at https://mipse.umich.edu/summer_school_2023.php. There will also be hands-on session in diagnostics and modeling, posters sessions and special topic mini-workshops.



As part of the registration fee, accommodations will be provided for students and post-doctoral scholars in university dormitories. Breakfast, lunch and several dinners will be provided. For attendees not staying in university housing, lunch and several dinners will be provided.

Attendance at the USLTPSS is limited. To apply to attend the USLTPSS, please fill out this application: - [Apply Here](#)

Applications received by **March 15** will receive full consideration. The application portal will be closed on **April 1, 2023**.

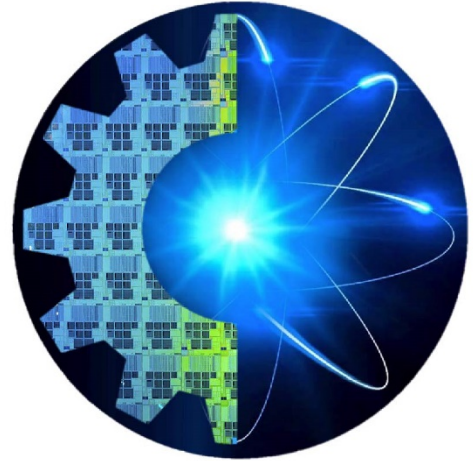
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Prof. Mark J. Kushner, University of Michigan, USA, mjkush@umich.edu

- **Report of the Workshop *Plasma Science for Microelectronics Nanofabrication***

Low temperature plasmas are essential to the manufacture of devices in the semiconductor industry, from the creation of extreme ultraviolet photons used in the most advanced lithography to thin film etching, deposition, and surface modifications. The US Department of Energy Office of Science Fusion Energy Sciences (FES) held a workshop titled *Plasma Science for Microelectronics Nanofabrication* in August 2022 to discuss the plasma science challenges and technical barriers needing to be overcome to continue to develop the innovative plasma technologies required to maintain and improve the internationally competitive US semiconductor industry. Although the report was intended to address domestic competitive issues, the science issues discussed are universal and international.



The report from the workshop is available on the FES website (<https://science.osti.gov/fes/Community-Resources/Workshop-Reports>) and can be downloaded here.

Contact:

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Meetings and Online Seminars

- **2nd Workshop on FAIR Data in Plasma Science**, May 3-4, 2023, Bochum, Germany

We kindly remind you to register for the **2nd Workshop on FAIR Data in Plasma Science** from May 3-4, 2023, at Ruhr University in Bochum (Germany). Note that virtual participation will be possible.

The workshop addresses the urgent needs to establish community standards when it comes to the handling of our research data and the adoption of the FAIR data principles in low-temperature plasma physics. The preliminary program is now available on the website, which includes also a link for registration:

<https://www.plasma-mds.org/ws-fair-data-plasma-science-2.html>

Please register as soon as possible if you plan to attend the workshop and spread the information to your colleagues and/or students who might be interested.

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markus.becker@inp-greifswald.de

Kerstin Sgonina, Christian-Albrechts-Universität, Germany, sgonina@physik.uni-kiel.de

- **The Online Low-Temperature Plasma (OLTP) Seminar Series**

The schedule for OLTP seminars and more information on the program, including links to past seminars, can be found at the OLTP website:

<https://theory.pppl.gov/news/seminars.php?scid=17&n=oltp-seminar-series>

The seminars are held on Tuesdays at 10:00 am EDT or EST via Zoom and are free to access from anywhere in the world.

Please see the notice of joint seminars with IOPS below.

Co-Chairs:

Dr. Mikhail Shneider, Princeton University, USA, shneyder@princeton.edu

Prof. Dr. Vasco Guerra, University of Lisboa, Portugal, vguerra@tecnico.ulisboa.pt

- **IOPS Online Seminars**

The *International Online Plasma Seminar (IOPS)* is continuing to provide the international community with regular opportunities to hear from leading researchers in the field. The program of the IOPS (and links to past seminars) can be found at: <http://www.apsgec.org/main/iops.php>.

Nominations of future speakers for May - October 2023 can also be made from the IOPS website **until March 20, 2023**.

Please see the notice of joint seminars with OLTP below.

Chair:

Prof. Quan-Zhi Zhang, Dalian University of Technology, China, qzzhang@dlut.edu.cn

- **Joint OLTP-IOPS Online Seminars**

The *Online Low-Temperature Plasma (OLTP) Seminar Series* and *International Online Plasma Seminar (IOPS)* are holding a series of jointly sponsored seminars. The details for viewing the seminars are listed on the websites of each seminar series (see announcements above). The jointly sponsored seminars are:

7 March (10 am EST), **Dr. Claudia Lazzaroni** (Laboratoire des Sciences des Procédés et des Matériaux, CNRS, France), *Experimental and numerical study of Ar/N₂ Micro Hollow Cathode Discharge jet*

16 March (8 am EST), **Dr. Igor Kaganovich** (Princeton Plasma Physics Laboratory, USA), *Review of the past history and recent developments in beam-plasma interaction and magnetized CCP*

18 April (10 am EST), **Prof. Tomoyuki Murakami** (Seikei University, Japan), *Network analysis and graph based approaches for plasma chemistry*

27 April (8 am EST), **Prof. Hae June Lee** (Pusan National University, Republic Korea), *Two-dimensional analysis of the nonlocal kinetic effects of electrons*

Community Initiatives and Special Issues

- **Special Issue of PSST on Fundamentals of Atmospheric Pressure Plasma Interactions with Complex Surfaces**

The use of atmospheric pressure plasmas (APPs) in healthcare, energy storage, chemical conversion and environmental stewardship often results in plasma interactions with complex surfaces. Complex surfaces entail interfaces with the APP that may be, non-planar, porous, reactive, deformable or liquid. The APP interacts with these interfaces through the plasma produced reactive fluxes (e.g., radical, hot particles,

electrons, ions, photons) incident onto the surface that both modify the surface and feedback to the plasma through, for example, charging, secondary processes, changing reaction probabilities or evaporation.

A Special Issue of *Plasma Sources Science and Technology* is devoted to papers describing experimental, computational and theoretical investigations of APPs interacting with complex surfaces having an emphasis on the fundamental plasma and surface properties and processes occurring during these interactions. This emphasis includes, but is not limited to, plasma self-organization at interfaces, species transport and control, radiation transport, diagnostics and new computational techniques, and fundamental data needed to understand plasma-surface interactions under these conditions.

While the issue is focused on the more unique aspects of APP interactions with complex interfaces with inherent short temporal and spatial length scales, potential instabilities and localized coupling between plasma properties and the interfacing surface properties, contributions addressing a broader range of conditions (such as pressure) that retain the characteristics of APPs or contribute to advancing our understanding of unique APP interactions with surfaces are also welcome.

Articles should be submitted via the Web using the PSST online submission form <https://mc04.manuscriptcentral.com/psst-iop>. Where the form asks for 'Article Type' please select 'Special Issue Article'. Then select 'Special Issue on Fundamentals of Atmospheric Pressure Plasma Interactions with Complex Surfaces' in the 'Special Issue' drop down box that appears.

The deadline for submissions is **31 May 2023**. PSST is able to publish special issues incrementally. This means that articles submitted early will be published as soon as they are accepted and prepared for publication, without being delayed waiting for other papers in the collection.

- **UM Prize for Excellence in Plasma Science and Engineering**

The Michigan Institute for Plasma Science and Engineering and the University of Michigan (UM) College of Engineering have established the **UM Prize for Excellence in Plasma Science and Engineering** to acknowledge contributions to significant advances in plasma science and engineering that have or will lead to significant societal benefits. The Prize is international in scope that will be awarded annually. Nominations are solicited for the Prize from the general plasma community. The area of contribution of the nominee may be in any field of plasma science and engineering.

- This international opportunity is open to all persons who are or have contributed to advances in plasma science and engineering at all stages of their career and at all levels of the career ladder.
- Nominations should include documented impact of excellence of contributions in making significant advances in plasma science and engineering that have or will lead to broad societal benefit(s). The impact of accomplishments should be commensurate with the nominee's stage of career.
- Nominees whose contributions are predominantly in education, public policy, government service, or industrial management are also encouraged.

The Prize recipient will receive a plaque and a \$5,000 honorarium; be the featured speaker at the MIPSE Annual Symposium; and have his/her/their award announced at an appropriate conference or symposium. Nominations are due **June 1, 2023**. The nomination process and other details are at: https://mipse.umich.edu/plasma_prize.php.

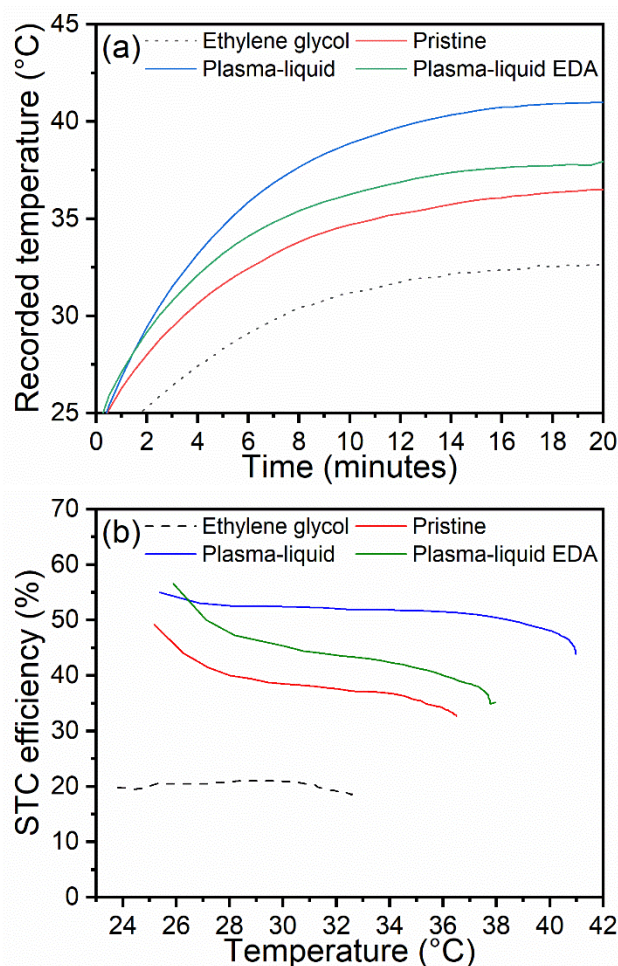
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Hybrid Plasma–Liquid Functionalization for the Enhanced Stability of CNT Nanofluids for Application in Solar Energy Conversion



(a) Variation in temperature of the nanofluids and ethylene glycol over 20 min of exposure to simulated solar radiation, and **(b)** their resulting solar–thermal conversion efficiency after accounting for heat lost.

We have used plasma-induced non-equilibrium electrochemistry to functionalize the surface of macroscopic ribbon-like assemblies of carbon nanotubes (CNTs) and enhance their dispersion within ethylene glycol for application in solar-to-thermal energy conversion. In particular, the nanofluids with CNTs that showed a combined nitrogen-based and high oxygen-based functionalisation—the “plasma–liquid” samples—performed exceptionally well. These showed a reduction in the contact angle from 84° to 35°, along with corresponding improvements in hydrophilicity and dispersion, leading to the enhancement of the absorption coefficient, reaching values greater than 2 cm⁻¹ at 600 nm, with much greater values above 5 cm⁻¹ observed at the logarithmic Van Hove peak at 256 nm. Solar thermal conversion experiments show that this “plasma–liquid” additive results in the greatest temperature increase—to above 40 °C—as well as a solar–thermal conversion efficiency of 50%. The long-term performance of the treated nanofluids was assessed, with values of 80% incident radiation absorption retained after 67 months of storage, with only a brief manual shake required to fully redisperse the material prior to UV–Vis measurements, highlighting the readiness for industrial application.

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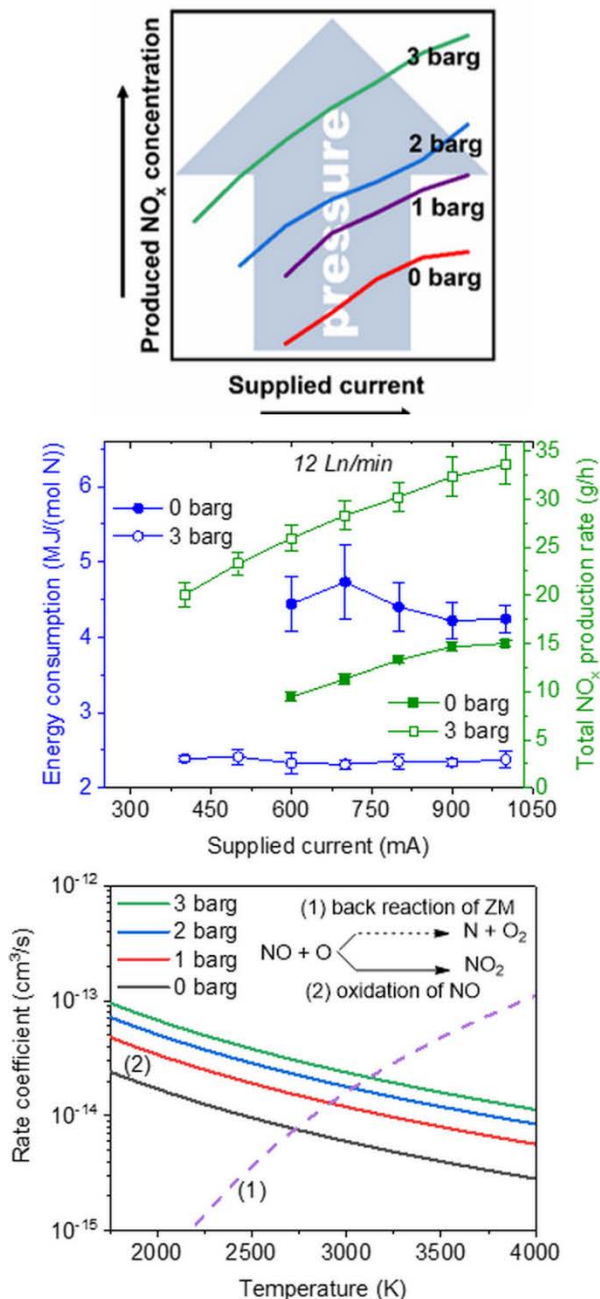
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Source:

Nanomaterials **12** (15), 2705 (2022).

<https://doi.org/10.3390/nano12152705>

Arc Plasma at Pressures above Atmospheric Helps Improve the Energy Cost and Production Rate of Nitrogen Fixation into NO_x



Arc plasma at elevated pressures to improve the energy cost and production rate of NO_x : **(top)** concept, **(center)** experimental data at 12 Ln/min of air, and **(bottom)** calculations showing the pressure effect on the oxidation rate of NO vs the back reaction of Zeldovich mechanism.

Many factors hinder the application of plasma-based nitrogen fixation (NF) for fertilizer production, e.g., the commonly observed inverse correlation between energy consumption (EC) and production rates (PR), or the necessity to enhance the selectivity towards NO_2 with is the desired product for a more facile formation of nitrate-based fertilizers. We investigated the use of a rotating gliding arc plasma for NF at elevated pressures (up to 3 barg), at different feed gas flow rates and composition. We demonstrate a dramatic increase in the amount of NO_x produced as a function of increasing pressure, with PR reaching as high as 69 g/h in oxygen-enriched air. Notably, this corresponds to EC of 1.8 MJ/(mol N) (the lowest reported for this high PR) and a nearly exclusive production of NO_2 . By comparing the kinetic rate coefficients of the Zeldovich mechanism (direct and back reactions) and the oxidation of NO to NO_2 as a function of pressure, we can ascribe this improvement not only to the enhanced thermal Zeldovich mechanism, but also to the increased rate of NO oxidation due to the elevated pressure. Altogether, this work identifies pressure as an important parameter to enhance the plasma NF performance.

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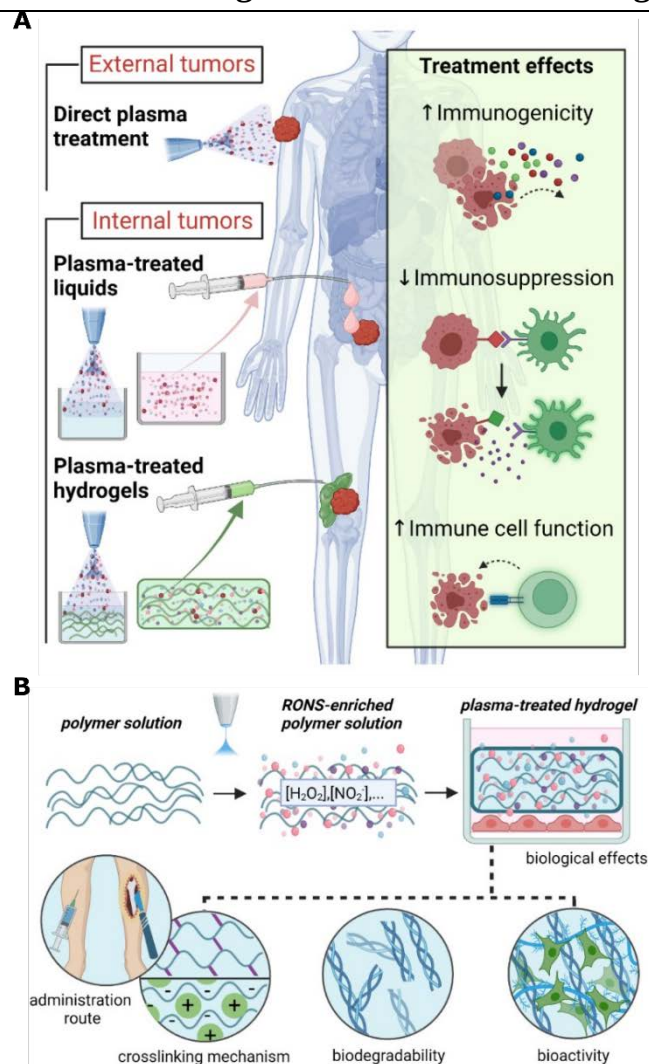
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Source:

ACS Sustainable Chem. Eng. **11**, 5, 1888–1897 (2023).
<https://pubs.acs.org/doi/10.1021/acssuschemeng.2c06357>

Current State of Cold Atmospheric Plasma and Cancer-Immunity Cycle: Therapeutic Relevance and Overcoming Clinical Limitations Using Hydrogels



(A) Treatment of cancer cells with plasma can promote anti-tumor immune responses through different mechanisms to ensure specific and systemic cancer clearance. Plasma-treated hydrogels (PTH) are a novel plasma treatment modality that may enable localized and minimally invasive treatment of internal tumors. **(B)** To obtain a PTH, an aqueous polymer(s) solution is first treated with plasma to enrich it with reactive species and is afterward crosslinked hereby entrapping the reactive species inside the polymeric network for their controlled delivery to target cells. The presence of different polymers could influence the physicochemical and biological properties and function of the PTH.

Cold atmospheric plasma can be used to selectively kill cancer cells. However, its true promise in oncology lies in the fact that plasma treatment could help drive and enhance anti-tumor immunity to ensure systemic and lasting therapeutic effects. In this review, we offer a critical, comprehensive, and tabular summary of different mechanisms by which plasma treatment (direct or indirect) could promote anti-tumor immunity. More specifically, we discuss: 1) induction of immunogenic cell death, 2) oxidative post-translational modification of tumor and its microenvironment, 3) epigenetic regulation of aberrant gene expression, and 4) enhancement of different immune cell functions. These insights could help the rational development of efficient (combinatorial) treatment strategies and meaningful clinical implementation of plasma.

Related to this, we discuss the clinical limitations of plasma associated with current treatment modalities (direct treatment and plasma-treated liquids). We then put into perspective plasma-treated hydrogels (PTH) as a novel modality that could both broaden and improve the clinical utility of plasma. On one hand, PTH could enable minimally invasive and high local delivery of reactive species to deeper tumor tissues. On the other hand, PTH may offer a way to combine plasma treatment with hydrogel-based drug delivery and tissue engineering for more advanced treatment strategies. Finally, we summarize the current knowledge on PTH and offer some practical considerations and future research directions related to this emerging research field.

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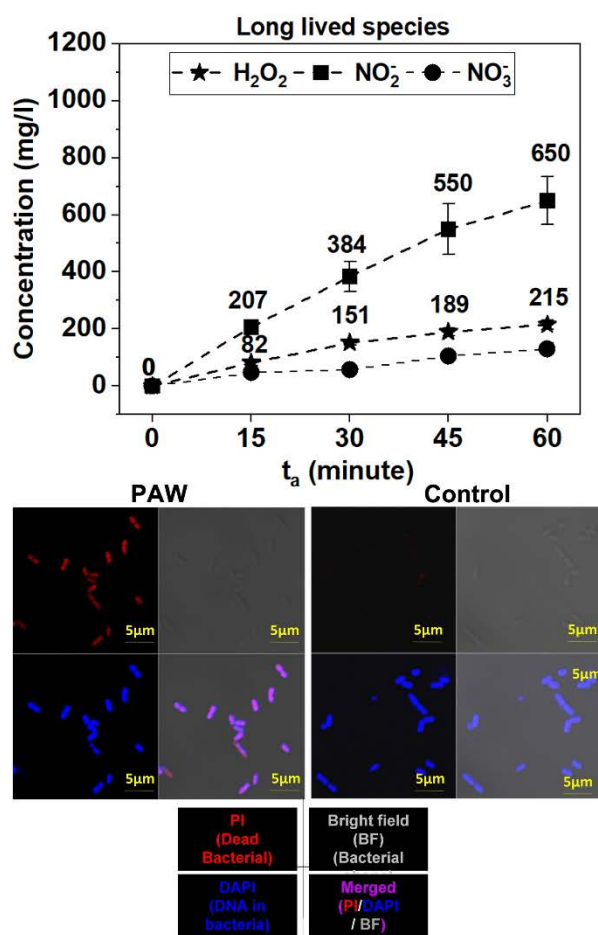
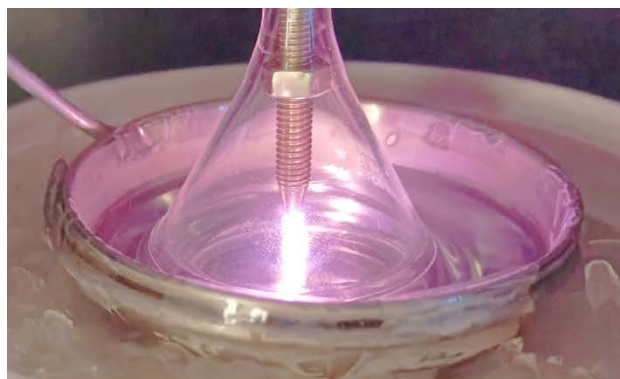
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Source:

M. Živanić, A. Espona-Noguera, A. Lin, C. Canal, Adv. Sci. **2023**, 2205803.

<https://doi.org/10.1002/advs.202205803>

Generation of Neutral pH High-strength Plasma-activated Water(hs-PAW) from a Pin-to-water (P2W) Air Discharge and Its Bactericidal Activity on Multidrug-resistant Pathogens



(top) Snapshot of the hs-P2W air discharge reactor (middle) PAW concentration increases with activation time, yielding a 0.1 % (w/w) of stable disinfectant solution at neutral pH (bottom) Confocal image shows the difference between the PAW-treated and untreated bacterial control. The PI fluorescence (red) of PAW-treated bacteria shows that the bacteria's inner cell membrane integrity was lost.

In recent decades, multidrug resistance (MDR) in bacterial infections has become a looming health and economic burden. MDR severity exaggerates hospital infection rates, especially for patients with an impaired immune system. As a result, lowering the bacterial burden is of significant concern. Plasma activated water, with its rich and diversified aqueous reactive nitrogen and oxygen species (RONS), is emerging as an alternative green technique in biomedicine.

This work investigated a Pin-to-Water (P2W) air discharge to generate a neutral pH high strength PAW (hs-PAW) and its bactericidal action without using any expensive carrier gas. The factors influencing PAW strength were explored and improved to generate hs-PAW, including water type, PAW temperature, plasma enclosure, and activation time. The chemistry was established by choosing a neutral pH and chilling the water to generate stable hydrogen peroxide. A design intervention in the plasma enclosure induced a higher nitrite concentration and made a stable higher PAW species of biomedical importance. Analysis of the metabolic assay and confocal images confirms the application of hs-PAW against MDR bacterial pathogens (hypervirulent *Klebsiella pneumonia* and Methicillin-resistant *Staphylococcus aureus*). This work demonstrates a simple P2W discharge reactor for generating PAW disinfectant liquid to address MDR pathogens, a technique that can be easily scalable for real-world medical applications.

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Source: Plasma Process. Polym. **10**, 1002 (2022).

<https://doi.org/10.1002/ppap.202200133>

Hybrid Plasma Generation over Liquid



(top) Mixture of special liquid placed in a vacuum chamber with pressure around (0.06 - 0.08 Torr). The radio frequency was connected to the spherical disc inserted into the liquid. **(middle, bottom)** Uniform and stable hybrid plasma generation over the liquid layer.

Hybrid plasma refers to the combination of two or more types of plasma sources to create a new type of plasma. The concept is based on the idea that combining different plasma sources can lead to new and unique plasma characteristics that can be utilized for specific applications. In this experiment, hybrid plasma was generated over liquids by combining gas discharge and electron beam plasmas. This experimental study investigates the ability of hybrid plasma generation over a special liquid mixture of vaseline and lecithin. The apparatus used consisted of radio frequency power connected to an electrode disc that was inserted into the liquid mixture placed in a vacuum chamber. The results show that, the plasma cloud formed uniformly around the liquid layer and was stable during the experiment. After the experiment, the droplets of water on the petri-dish used for the experiment were observed to be more viscous than on the other petri-dish not used. The potential applications of hybrid plasma generation over liquids involve the use of fundamental physics laws, including the laws of thermodynamics, electrodynamics, and plasma physics. These laws are crucial to the understanding of plasma generation, its applications, characteristics, and interactions with the liquid droplets or films.

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New Resources

- **New Book: *High-Density Helicon Plasma Science - From Basics to Applications***

High-density helicon plasma sources, produced by radio frequency excitation in the presence of magnetic fields, have attracted considerable attention thanks to its broad applicability in various fields, from basic science to industrial use. This book, entitled “High-Density Helicon Plasma Science - From Basics to Applications,” (Springer Nature Publishing company) by S. Shinohara, is the first helicon book in the world.

- Presents a contemporary primer of helicon plasma science
- Offers an integrated review of the physics of helicon plasma and its applications
- Covers a wide range of topics, from fundamental plasma physics to cutting-edge applications

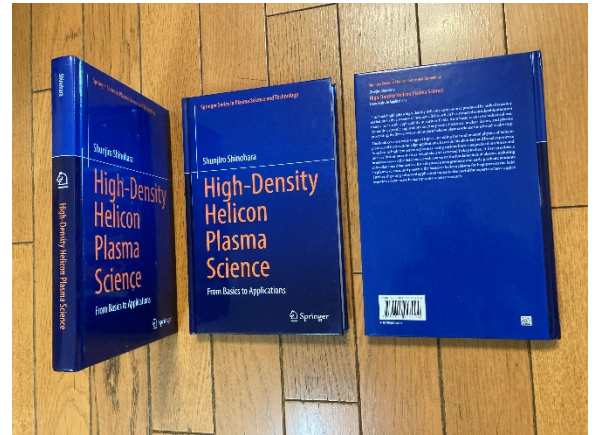
This book offers a review of modern helicon plasma science for a broad readership. It covers a wide range of topics, including the fundamental physics of helicon plasma and their cutting-edge applications. It is based on Prof. Shinohara’s abundant and broad experience from low to high temperature plasmas, using various linear magnetized machines including nuclear fusion devices such as tokamaks and reversed field pinches.

The book first provides a brief overview of the field and a crash course on the fundamentals of plasma, including miscellaneous diagnostics, for advanced undergraduate and early graduate students in plasma science, and presents the basics of helicon plasma for beginners in the field. Further, presenting advanced application topics, it is also useful for experts as a quick overview of extensive helicon plasma science research.

The link for acquiring the book (pdf or hard copy) is:
<https://link.springer.com/book/10.1007/978-981-19-2900-7>

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Career Opportunities

(for other career opportunities, see: <https://mipse.umich.edu/jobs.php>)

- **Lecturer (Assistant Professor) in Low-Temperature Plasma Modelling, York University, UK**

The University of York is seeking a Lecturer in Low-Temperature Plasma modelling and simulation who will lead an additional independent world-class research program to complement the existing expertise. The York Plasma Institute (YPI) addresses a portfolio of plasma research from fundamental blue skies to impact-driven across three research strands: Low Temperature Plasmas, Matter at the Extremes and Magnetic Confinement Fusion. This post has been created to complement and enhance the rapidly growing activities in Low Temperature Plasma science at the YPI.

Role: You will develop and lead a world-class research program in an area within low-temperature plasma modelling and simulation, including obtaining research funding, managing research teams, and producing high-quality research outputs. In addition, you will design and deliver teaching across a range of modules, act as academic supervisor of students and undertake administrative responsibilities across the School.

Expected skills: You will have a PhD in Low-Temperature Plasma modelling and an appropriate academic professional and teaching qualification, or a willingness to complete a Postgraduate Certificate in Academic Practice. Specialist knowledge in low-temperature plasma modelling (development) methods and techniques is essential. Your research expertise will complement the YPI and low-temperature plasma strand research strategy and goals. You will have a clear vision for an independent research program that aligns with UK and international research funding priorities and the ability to attract research funding and lead research projects and teams. You already have a proven track record of high-quality research, including evidence of dissemination of research findings, e.g., journal papers. You will have the ability to enthuse and engage students through the design and delivery of teaching material. In general, you will need a positive attitude to colleagues and students, showing commitment to equality, diversity and inclusion while having a collaborative ethos and a willingness to work proactively with colleagues in other areas and institutions.

For more information and applications see: <https://jobs.york.ac.uk/vacancy/lecturer-in-plasma-physics-490244.html>. **Closing date: 17 March 2023.**

Contacts:

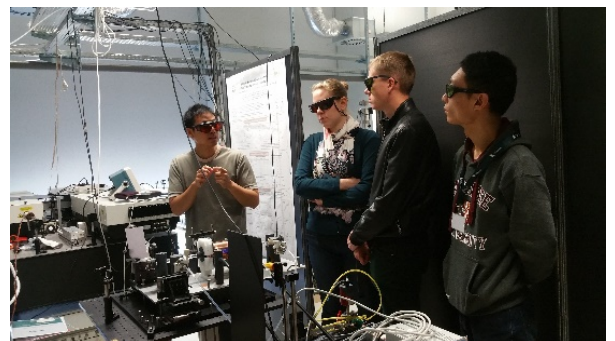
Prof. James Walsh, Dr. Erik Wagenaars

York University, UK

james.l.walsh@york.ac.uk, erik.wagenaars@york.ac.uk

- **Post-doctoral Researcher in Micro-Plasma-Aided Combustion, Laboratory for Plasma Physics, France**

A three-year post-doctoral researcher position is open (1 January 2023) at the **Laboratory for Plasma Physics** (LPP, UMR7648) at Ecole Polytechnique near Paris, France. The project is dedicated to experimental study of improving of **micro-combustion** by non-equilibrium **plasma** and advanced **laser diagnostics**. The postdoctoral fellow will be responsible for the design of the microreactor, the studies of the physics and chemistry of plasma and combustion, and the qualification of the micro-combustion regimes at atmospheric pressure of various fuels. The post-doctoral fellow will have the opportunity to use and improve several optical techniques to characterize the



discharges and the combustion. Two laser systems, one nanosecond (7 ns) and the other picosecond (26 ps), will be available to develop TALIF, E-FISH or other diagnostics. We are looking for a PhD in the field of **laser diagnostics**, and/or **plasma/combustion** research. **European citizenship** is required for the position. UK or Swiss citizenship is possible. To apply, provide a letter describing your research interests and motivation, list of publications, CV, two recommendation letters to the contact listed below.

Contact:

Dr. Svetlana Starikovskaia

Laboratory for Plasma Physics, Ecole Polytechnique, France

svetlana.starikovskaia@lpp.polytechnique.fr

- **Research Fellow - Thin Film Deposition and Plasma Diagnostics, Sheffield Hallam University, UK**

The National HIPIMS Technology Centre at Sheffield Hallam University is looking to recruit a PhD-level research fellow on a permanent basis in the field of plasma physics for physical vapor deposition. The successful candidate will have considerable experience with using High Power Impulse Magnetron Sputtering, conventional magnetron sputtering or low temperature plasmas for thin film deposition and plasma diagnostics methods including electrostatic probes, energy-resolved mass spectroscopy and absorption spectroscopy. They should be familiar with theory of plasma discharges and have the background required to extract plasma parameters from plasma diagnostics data and with methods to perform time-resolved plasma measurements. Responsibilities will include writing refereed publications, managing parts of a multi-partner international project, advising PhD students and delivering presentations at international conferences.

The candidate will join a currently running EPSRC-funded project with partners at the Department of Biomedical Research Sciences at Sheffield Hallam University and the Departments of Materials and Physics at Imperial College London. The project focuses on the development of antimicrobial thin films using High Power Impulse Magnetron Sputtering in combination with plasma-induced patterning.

Sheffield Hallam welcomes applications from all candidates irrespective of age, pregnancy and maternity, disability, gender, gender identity, sexual orientation, race, religion or belief, or marital or civil partnership status. The University may be able to sponsor the employment of international applicants in this role; this will depend on a number of factors specific to the individual applicant.

Applications can be submitted through: <http://bit.ly/3lmrWBA>. Please direct questions to the contact below.

Contact:

Prof. Arutjun Eghisarian

Sheffield Hallam University, UK

A.Eghisarian@shu.ac.uk

- **Post-doctoral Research Fellow, Modeling and Simulation of Plasma Torches, University of Texas, USA**

The Center for Predictive Engineering and Computational Sciences in the Oden Institute for Computational Engineering and Sciences at the University of Texas at Austin is searching for Postdoctoral Scholars in computational fluid and plasma dynamics to join a large research project to develop high fidelity predictive simulation models of inductively coupled plasma (ICP) torches. An ICP torch presents a multi-physics modeling challenge which will require coupled solution of the compressible Navier-Stokes, Maxwell, Boltzmann and radiative transport equations. This postdoc will contribute to the development of models and algorithms for ICP torch simulation and their implementation in a finite-element-based software infrastructure. They will also participate in the verification and validation of the torch simulator, and will be part of an interdisciplinary team working at the forefront of many areas of physics, computational science, and computer science. Knowledge of finite element and/or spectral methods and prior software experience in large-scale parallel

code development, including MPI, C++, multi-threading, and git revision control are required. Applicants must have a Doctorate in Science, Engineering, Computer Science, Computational Science, Applied Mathematics, or a related technical field. Candidates with experience in simulation of fluid mechanics and/or plasma physics are preferred.

For more information about the project and team, visit <https://pecos.oden.utexas.edu>. To apply, please send a cover letter describing your interests, a CV, and a list of three references to pecos.recruit@oden.utexas.edu.

Contact:

Prof. Robert Moser

University of Texas at Austin, USA

rmoser@oden.utexas.edu

- **Faculty Position, Department of the Mechanical Engineering, University of Minnesota, USA**

The Department of Mechanical Engineering at the University of Minnesota Twin Cities, USA, invites applications for multiple full-time, tenure-track positions beginning as early as Fall 2023 in manufacturing and supporting disciplines. Candidate research should align with one or more of the following disciplinary and application areas:

- **Manufacturing, materials, and mechanical design** — with applications to biomedical devices, additive manufacturing, smart materials, and machinery.
- **Thermodynamics and heat and mass transfer** — with applications that relate to industrial manufacturing processes, including heat management in devices, bio heat transfer, and fabrication and evaluation of materials for energy storage and conversion.
- **Plasma and aerosol science and engineering** — with applications to semiconductor manufacturing, clean room and particle technology, and filtration.

We are seeking a faculty candidate who complements current expertise in the Department of Mechanical Engineering and will grow strategic synergistic collaborations within the department and the University. We primarily seek candidates at the assistant professor level; however, we will consider senior level appointments for exceptionally qualified candidates.

Please direct questions to the contact listed below. More information about the opening and department can be found at: <https://cse.umn.edu/me/me-faculty-opening-manufacturing>.

Interested candidates are invited to contact with questions about the positions.

Contact:

Prof. Uwe Kortshagen

University of Minnesota, USA

kortshagen@umn.edu

Collaborative Opportunities

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

Disclaimer

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Newsletter is supported by:

US National Science Foundation



**US Department of Energy
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Fusion Energy Sciences**



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and Engineering**

