

International Low Temperature Plasma Community

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

Newsletter 07

8 October 2020

Images to Excite and Inspire!

Thank you for submitting your images, some of which are shown here. Those images already submitted will appear in later Newsletters. Please do send your images (with a short description or source) to iltpc-central@umich.edu. The recommended image format is JPG or PNG; the minimum file width is 800 px.



Compared to DC discharges, it is possible to widely control the sheath thickness in RF discharges by varying the excitation RF frequency and its power. This provides the opportunity to utilize a capacitively coupled RF discharge as a tunable element for future electronics. [Andrei Khomenko and Sergey Macheret, “Capacitively coupled radio-frequency discharge in alpha-mode as a variable capacitor,” 2019, J. Phys. D: Appl. Phys. **52** 445201]

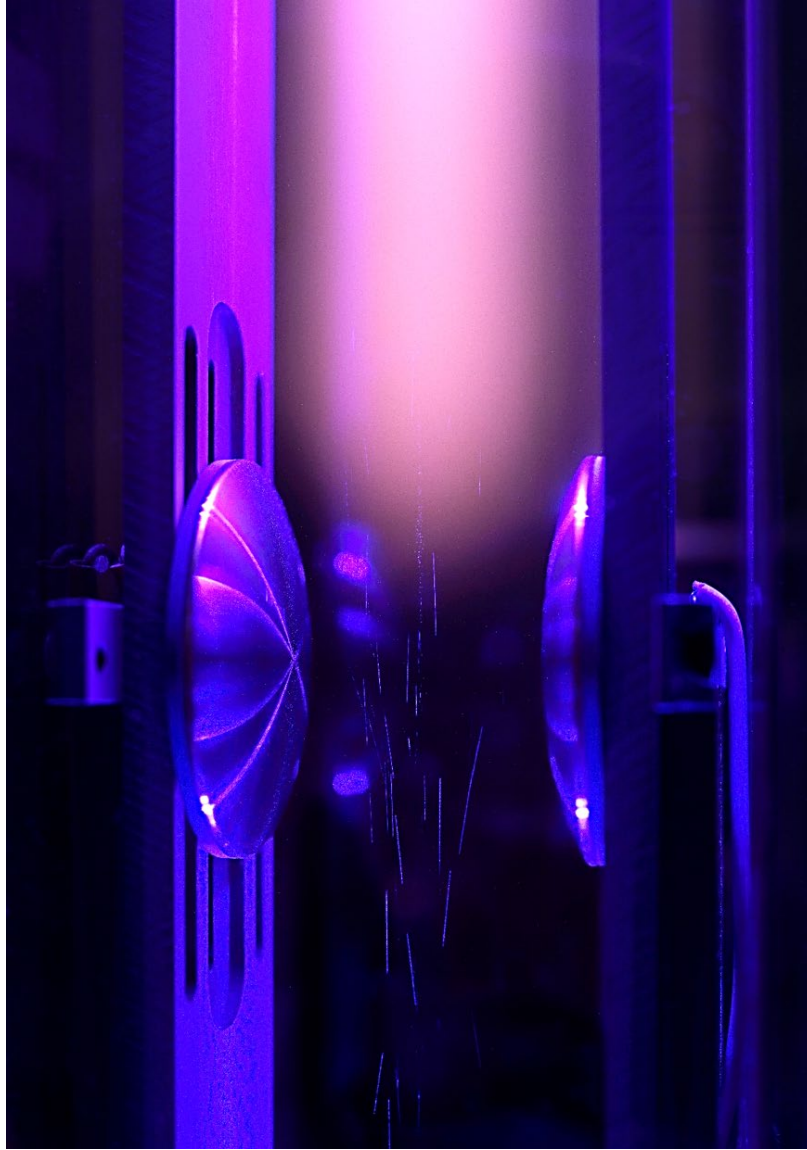
Contact: **Dr. Andrei Khomenko**, Purdue University, akhomenk@purdue.edu.



Transferred atmospheric pressure plasma from 4 mm (ID) silicone tube to 1.5 mm (ID) PU tube. The operating conditions are: (1) Primary plasma jet: Voltage = 10 kV, Pulse width = 210 μ s, Repetition rate = 4.76 kHz, 10 SLM He, (2) Secondary plasma jet: 6 SLM He. (Photo by Ms. Y. J. Wei.)

Contact: **Prof. J. H. Hsieh**, Center for Plasma and Thin Film Technologies, Ming Chi University of Technology,

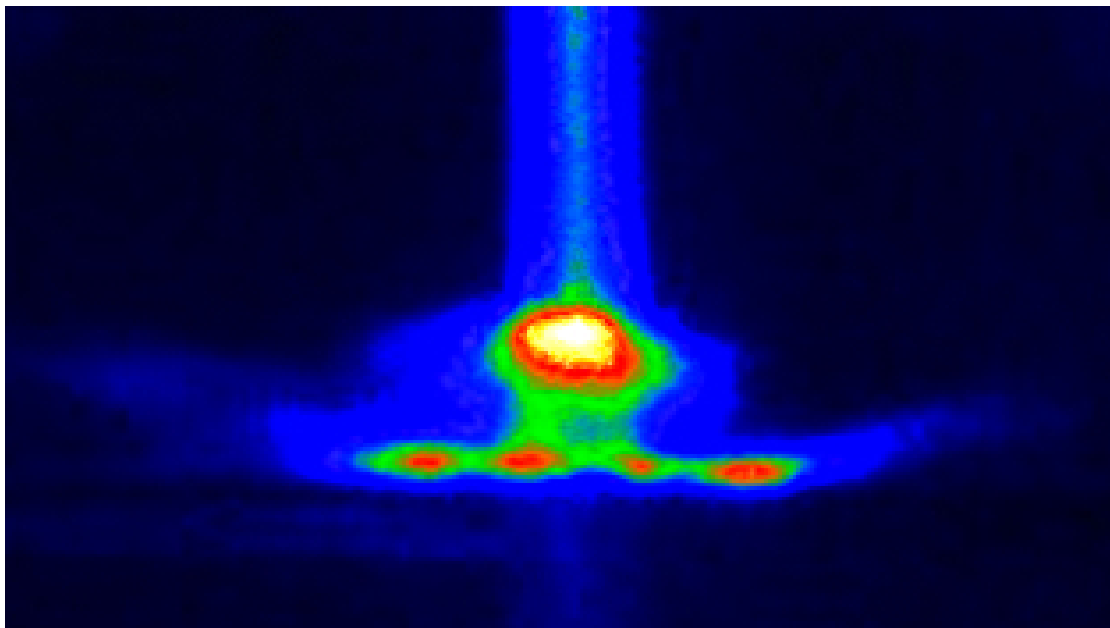
jhsieh@mail.mcut.edu.tw.



Microparticle trajectories in the spatial plasma afterglow of an inductively coupled plasma. The two metal disks on the sides are electrodes over which a potential difference can be applied to obtain the charge of the microparticles from the measured acceleration. (No potential was applied for this photo.) The goal is to study the (de)charging of microparticles in spatial plasma afterglows.

Contact:

Ir. Boy van Minderhout (b.v.minderhout@tue.nl) and **Dr. Ir. Job Beckers** (j.beckers@tue.nl), Eindhoven University of Technology. Photo by Bart van Overbeeke.



ICCD image of a He plasma jet hitting a quartz substrate in between two vertical quartz plates. The operating conditions are: (1) Plasma jet: Voltage = 10 kV, Pulse width = 230 μ s, Repetition rate = 4.35 kHz, 10 SLM He. (Photo by Ms. Lily P. L. Liu)

Contact: **Prof. J. H. Hsieh**, Center for Plasma and Thin Film Technologies, Ming Chi University of Technology, jhhsieh@mail.mcut.edu.tw.

In this issue:

- Images
- Call for Contributions
- General Interest Announcements
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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 **October 31, 2020**.

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_v03.docx. The highlight consists of an image and up to 200 words of text. 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.

General Interest Announcements

- The ILTPC is maintaining a list of LTP conferences. With many meetings being canceled and rescheduled, we thought this would be useful for minimizing conflicts and planning future trips. The data may not be 100% accurate, so please let us know of changes in conference scheduling. View-only link to the schedule: <https://docs.google.com/spreadsheets/d/1XoD6Fn7AP0HFTQJpPCETrRIQhx8ID-iz4XUMyv9X7zo/edit?usp=sharing>.

Contact:

ILTPC

iltpc-central@umich.edu

Meetings and Online Seminars

- **Online LTP Seminar**

Reminder!! Upcoming seminars: **October 13, October 27, November 10**. More information on the Online LTP Seminar: https://mipse.umich.edu/ltp_seminars.php.

- **International Online Plasma Seminar (IOPS)**

Reminder!! Upcoming seminars: **October 22, November 5, November 19**. More information on the International Online Plasma Seminar (IOPS): https://mipse.umich.edu/online_seminars.php.

Speaker Nominations: Nominations are solicited for speakers for the January-June 2021 sessions of IOPS. Two types of seminars will be presented:

Research Highlight (20 minutes + questions): This presentation is intended to summarize a recent publication and is more highly focused on the topic of the publication.

Tutorial/Review (30-45 minutes + questions): This presentation more broadly addresses a topic and is more like a traditional departmental seminar.

Please submit nominations via this Google form with a deadline of **30 November 2020**:

https://docs.google.com/forms/d/e/1FAIpQLSdWSXA_JkSGrKukZ3gDKBFQ6lffOJ6PC5H5fiu-Ihg3eE7GSYG/viewform

- **MIPSE (Michigan Institute for Plasma Science and Engineering) Seminar Series**

The MIPSE seminar series, usually held as an in-person event, will be totally virtual this Fall. There will be five seminars during Fall 2020 covering the full range of plasma topics (not only LTP). The seminars are held on Wednesdays at 3:30 pm (US East Coast Time). The schedule and abstracts can be viewed at https://mipse.umich.edu/seminars_2021.php. Please send a request for the Zoom link to view the seminars to mipse-central@umich.edu. Seminars will be recorded and posted (with slides) at the same website.

Past MIPSE seminars (recordings and slides) can be viewed from: <https://mipse.umich.edu/seminars.php>.

Interviews of past seminar speakers can be viewed from: https://mipse.umich.edu/life_overview.php.

Contact:

MIPSE Central

mipse-central@umich.edu

- **7th International Plasma Science & Entrepreneurship Workshop (2 & 3 November 2020)**

Key topics and themes:

- Plasma medicine, medical and healthcare
- Plasma surface modification & thin films
- Atmospheric pressure plasma @ micro/nano scale
- Atmospheric pressure plasma jet (APPJ)
- Nanoparticles generation and particle surface treatment
- Surface diagnostics, energetics, analytics and metrology
- Plasma parameterization, diagnostics, simulation
- Plasma for emission abatement & CO₂
- Plasma parameterization, diagnostics, simulation

About 100 leading international scientists from universities, institutes and firms & scientific entrepreneurs are expected to participate. The workshop will be a PhD (student) expert-level workshop focused on the achievements, challenges, and opportunities for the scientific and entrepreneurial community working in the field.

More information: <http://www.visiondynamics.nl/workshops/7th-plasma-workshop>.

Please contact **Josefien van de Laar** (josefien.vdlaar@visiondynamics.nl) by **October 15, 2020** if you are interested in attending.

Contact:

Hugo de Haan, VD Science & Entrepreneurship BV (VD S&E)

hugo.dehaan@visiondynamics.nl

- **QPTDat FAIR Research Data in Plasma Medicine Workshop**

On October 28–29, 2020, the BMBF-funded joint project *Quality assurance and linking of research data in plasma technology* - QPTDat (<https://www.forschungsdaten.org/index.php/QPTDat>) hosts the virtual workshop: *FAIR Research Data in Plasma Medicine*.

The program of the workshop is now available at: https://www.forschungsdaten.org/index.php/QPT-Dat_Workshop_Plasma_Medicine.

The goal of the workshop is to bring together researchers in the field of plasma medicine with research data management experts to discuss requirements and possibilities for research data management in accordance with the FAIR principles. Experts will provide an overview over existing procedures and ideas for the

provision and usage of quality assured research data, e.g. as a basis for data-driven science. On this basis, approaches for the further development of an ontology, metadata standards, and quality criteria supporting a simplified publication and re-use of data in the field of plasma medicine will be worked out in the course of the workshop. The collected ideas will be incorporated into the services to be developed in the framework of QPTDat and thus be made available to the community.

Participation in the workshop is only possible with prior registration. Registered persons will receive further information about participation in the virtual event a few days before the workshop starts.

Link to the registration form: <https://forms.gle/fytU1hzVTmnC1r3r9>.

Contact:

Dr. Markus Becker,

Leibniz Institute for Plasma Science and Technology (INP)

markus.becker@inp-greifswald.de

Community Initiatives and Special Issues

- **Special Issue *Dielectric Barrier Discharges* in the journal *Plasma***

Dielectric barrier discharges (DBD) have been investigated for more than a century and were mainly used for ozone production until applications like plasma medicine and plasma-assisted conversion and catalysis sparked new interest. The rise of nanosecond-pulse generators for the generation of plasma has made it possible to deliver voltage pulses on the same time scale as the streamer lifetime in a DBD. This Special Issue focusses on DBDs from nanosecond to microsecond pulses, with an emphasis on the following topics:

- Diagnostics
- Physics and diagnostics of nanosecond pulsed DBDs
- Self-organization in DBDs
- Applications of DBDs: plasma medicine, plasma-assisted conversion and catalysis, and plasma agriculture
- DBDs in contact with liquids: experiment and simulation

The deadline for manuscript submission is **March 15, 2021**.

More information: https://www.mdpi.com/journal/plasma/special_issues/dbd.

Guest Editors:

Dr. Katharina Stapelmann, North Carolina State University, katharina_stapelmann@ncsu.edu

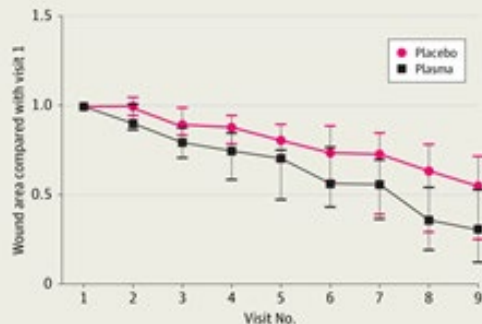
Dr. Pietro Ranieri, North Carolina State University

Dr. Savino Longo, University of Bari

Clinical Trial on Plasma-Supported Wound Healing

FINDINGS

After 8 treatments, CAP therapy yielded significant increases in wound healing, total area reduction, and time to relevant wound area reduction compared with placebo measured at visit 9



Remaining wound area:

CAP: 30.5% (95% CI, 12.3%-53.5%)
Placebo: 55.2% (95% CI, 25.2%-72.0%)

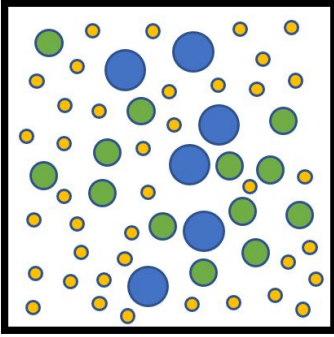
A prospective, randomized, placebo-controlled, patient-blinded clinical trial with 65 diabetic foot ulcer wounds from 45 patients was realized using the argon-driven cold atmospheric pressure plasma jet kINPen MED® (neoplas med, Greifswald, Germany). Plasma-supported therapy resulted in beneficial effects in chronic wound treatment in terms of wound surface reduction and time to wound closure independent from background infection. This led to the strong scientific support of the hypothesis that plasma application in wound healing is not only based on its anti-septic effects but above all on the direct stimulation of tissue regeneration which is the strength and unique feature of cold atmospheric plasma in comparison to conventional and established wound care measures.

Contact: Prof. Dr. Thomas von Woedtke, Leibniz Institute for Plasma Science and Technology (INP)
woedtke@inp-greifswald.de.

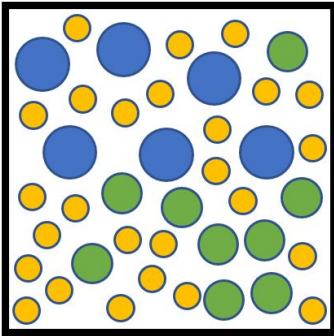
Source:

B. Stratmann, T.-C. Costea, C. Nolte, J. Hiller, J. Schmidt, J. Reindel, K. Masur, W. Motz, J. Timm, W. Kerner, D. Tschoepe
JAMA Network Open. 2020; 3(7): e2010411.
[doi:10.1001/jamanetworkopen.2020.10411](https://doi.org/10.1001/jamanetworkopen.2020.10411)

Analytical Formula for Mean Particle Diameter and Dispersion after Nucleation Burst



Nucleation burst



Growth on clusters
by deposition

An important problem in particle nucleation is the lack of simple analytical estimates for the size and the dispersion of produced clusters. These estimates would predict a cluster's characteristics without using complex numerical simulations in order to capture both nucleation and growth which are on different time and volume scales.

Using Friedlander's model (S. K. Friedlander, Ann. N.Y. Acad. Sci. 354 (1983)) we obtain an analytical estimate of the cluster mean diameter and diameter dispersion at the end of the nucleation burst (phase of maximum cluster nucleation). We find that the diameter is proportional to the initial gas concentration and inversely proportional to the cooling rate, confirming both previous simulations and the simulations we ran using the NGDE code, which solves the particle size distribution evolution and takes into account both nucleation and coagulation of particles.

This result can be used to estimate the final particle distribution from its first two moments, as a function of the initial gas concentration and cooling rate, which depends on external pressure and gas flow.

In particular, our result could be used to explain the characteristics of nanoparticles produced by dielectric barrier discharge (or by other low temperature plasma production method). See, for example, J. P. Borra, J. Phys. D: Appl. Phys. **39**, R19 (2006). Using our results, one could explain how do the process parameters such as filament energy or pressure impact final mean particle diameter and diameter dispersion.

Contact:

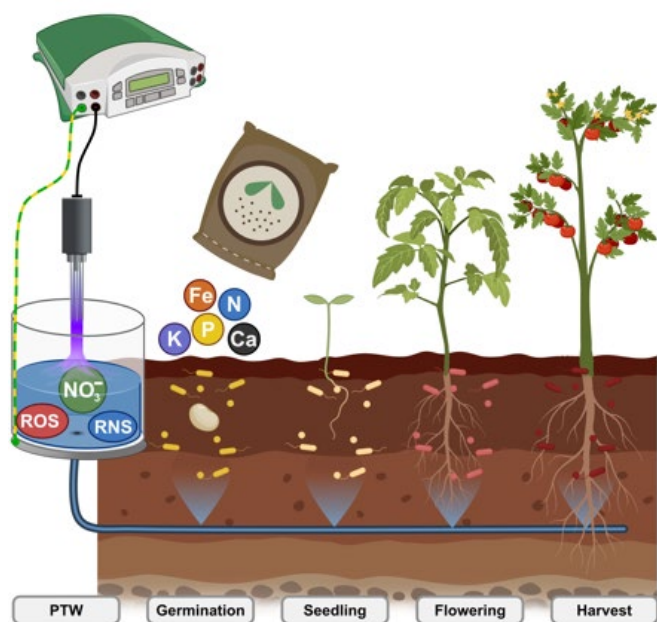
Mikael Tacu, École Normale Supérieure Paris-S

Dr. Igor D.Kaganovich and Dr. Alexander Khrabry, Princeton Plasma Physics Lab.

mikael.tacu@gmail.com

Source: <https://journals.aps.org/pre/abstract/10.1103/PhysRevE.102.022116>

Plasma Agriculture: Review from the Perspective of the Plant and Its Ecosystem



Plasma and plasma-treated water applied during different developmental stages of plants

Plasma agriculture details the role of nonthermal plasma in the development of plants from seeds to crops. Several publications reported enhanced plant growth, improved stress tolerance, and antimicrobial effects of plasma treatment and plasma-treated water. In this review, we present an overview of the recent plasma agriculture literature and put it in the context of the plant needs and the effects on the plant ecosystem. We will discuss key developmental stages of plants and their needs, the different growth environments from hydroponics to soilless and soil substrates, and the plant microbiome. This review provides the context to design plasma-based fertilization strategies to address the needs of plants and their ecosystem.

Contact:

Dr. Katharina Stapelmann

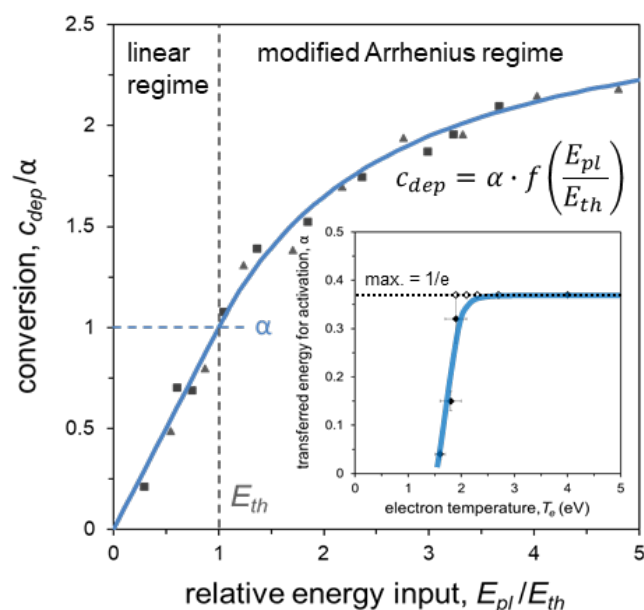
North Carolina State University

kstapel@ncsu.edu

Source: <https://doi.org/10.1002/ppap.202000162>

More information: <https://cals.ncsu.edu/news/fertilizer-of-the-future/>

Plasma Polymerization of Hexamethyldisiloxane – Revisited



Conversion of HMDSO in the plasma depending on energy transfer and energy input per monomer molecule

Plasma polymerization using hexamethyldisiloxane (HMDSO) as model monomer is revisited providing the fundamentals for a macroscopic approach based on averaged quantities. The conversion of monomer into film-forming species in the gas phase is governed by energy transfer, α , depending on electron temperature, T_e , and energy invested per monomer, E_{pl} , with respect to a threshold energy, E_{th} , observed for activation reactions.

This approach thus combines plasma physics, that is, the importance of *EEDF*, and plasma chemistry, that is, the importance of bond dissociation energies and might be of relevance for plasma-chemical reactions in general.

Contact:

Dr. Dirk Hegemann

EMPA, Swiss Federal Laboratories for Materials Science and Technology

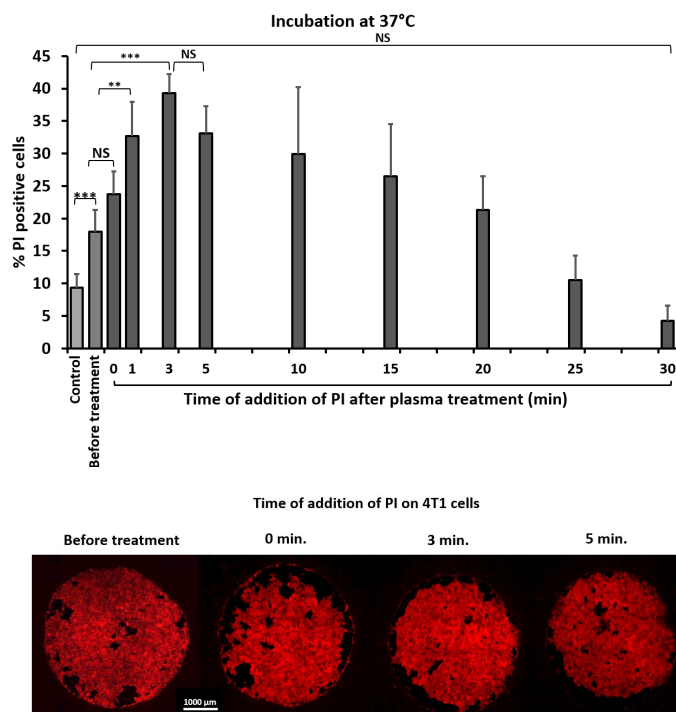
dirk.hegemann@empa.ch

Source: <http://dx.doi.org/10.1002/ppap.202000176>

More information (author = Hegemann):

<https://www.dora.lib4ri.ch/empa/author-list>

New Insights on Molecular Internalization and Drug Delivery Following Plasma Jet Exposures



Propidium iodide uptake kinetics for: (top) HeLa cells and (bottom) 4T1 cells

We evaluated cold atmospheric-pressure plasma as a drug delivery tool for human cervical cancer HeLa and murine breast carcinoma 4T1 cells. For the first time to our knowledge, substance uptake kinetics after plasma treatment was investigated. The percentage of permeabilized cells for propidium iodide and an anti-cancer agent, doxorubicin, was higher when the drugs were added a few minutes after treatment. Our results indicate that plasma treatment induces a transient, quite long time persisting, but reversible action that leads to cell membrane uptake. The use of four protocols for plasma delivery, i.e. -direct, indirect (so called PAM), electric field alone and electric field and consecutive PAM- treatments, reveals a plasma-induced cell sensitization, implying both electric field and short living Reactive Oxygen and Nitrogen Species (RONS).

Plasma-induced cell sensitization plays a key role for cell line positive with PAM exposure (e.g. HeLa cell in this work) or cells for which PAM treatment is almost inefficient (e.g. 4T1 cells in this work). This work demonstrates the potential of cold plasma for cell uptake and opens new opportunities for combined protocols with electroporation and/or chemotherapy. We also document that plasma induced the formation of actin stress fibers into cells revealing a mechanical stress.

Contact:

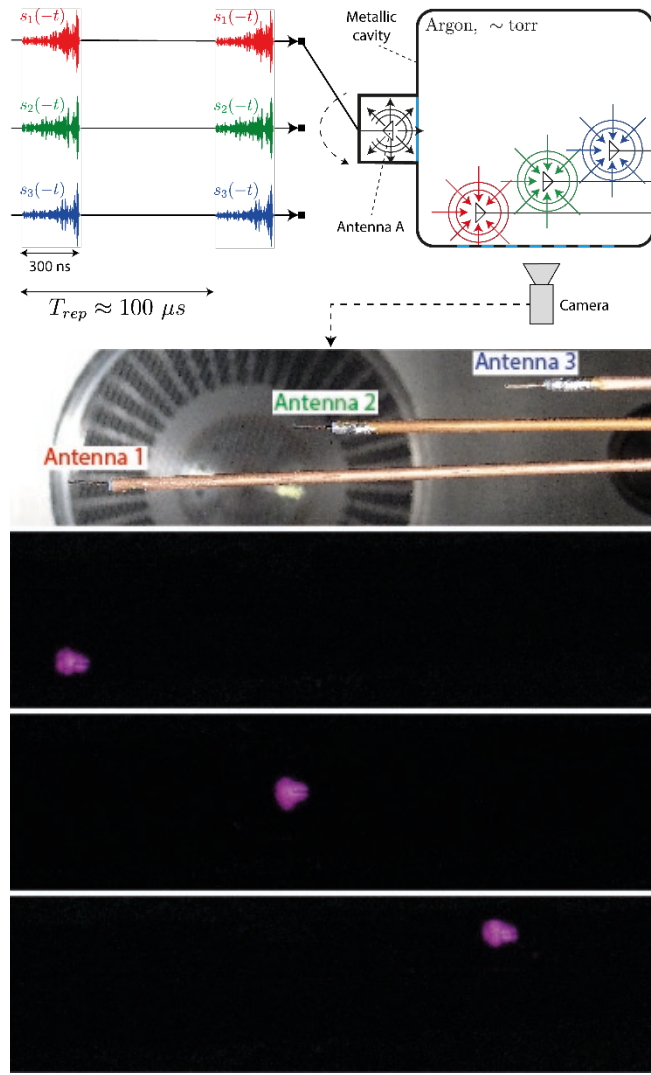
Dr. Eric Robert, GREMI CNRS-Université d'Orléans

eric.robert@univ-orleans.fr

Source: Vijayarangan et al,

<https://doi.org/10.1016/j.ijpharm.2020.119874>

Dynamic Control of the Spatial Position of Low Pressure Nanosecond Plasmas



(Top) Sketch of the experimental setup.

(Bottom) Pictures of the three antennas on which the focusing of the waves by TR occurs as well as the pictures of the plasmas ignited on them.

This work presents an innovative low-pressure microwave plasma source excited by time reversal (TR) microwave signals. TR deals with focusing electromagnetic waves by reversing in time the cavity response signals.

In contrast with the usual microwave plasma sources, TR plasmas allows to ignite a localized plasma, the position being controlled in real time by the TR signal. This source aims to locally process materials of large dimensions at low pressure.

In a TR experiment, a pulse (8 ns width at 2.4 GHz) is first emitted from antenna A and transmitted to antennas labelled 1, 2 and 3. The three corresponding radiated fields, $s_1(t)$, $s_2(t)$ and $s_3(t)$ (which last 300 ns) are recorded. These signals, time reversed i.e. $s_1(-t)$, $s_2(-t)$ or $s_3(-t)$, transmitted from antenna A leads to a spatio-temporal focusing of the waves (of 8 ns) on the corresponding antennae. It means that the injected signal allows to focus microwave near the chosen antennae and to ignite a plasma at the focusing instant and location depending on the pulse amplitude as well the repetition rate.

Using this principle, the plasma location is controlled by modifying the waveform transmitted into the cavity.

Further studies focused on the spatio-temporal dynamics are under investigations as well as advanced transient field shaping methods.

Contact:

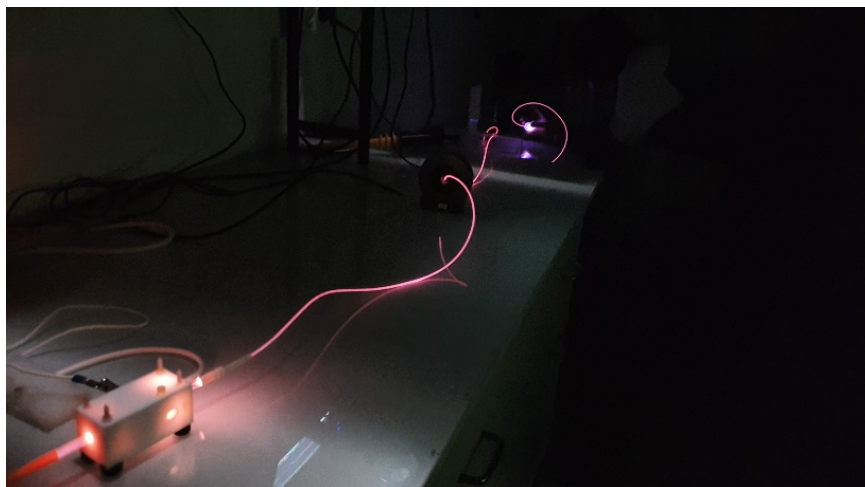
Dr. Valentin Mazières

LAPLACE Université de Toulouse

valentin.mazieres@laplace.univ-tlse.fr

Source: V. Mazières, R. Pascaud, L. Liard, S. Dap, R. Clergereaux, and O. Pascal, "Plasma generation using time reversal of microwaves", Appl. Phys. Lett, 2019. <https://aip.scitation.org/doi/full/10.1063/1.5126198>

A New Extra-Long Atmospheric Plasma for Endoscopic Applications



Thanks to a collaboration between gastroenterologists, engineers, and plasma chemists, a new extra-long plasma (over 2 m) has been developed for endoscopic applications. The very first paper on this topic, “Optical and Electrical Characteristics of an Endoscopic DBD Plasma Jet”, is now published in *Plasma Medicine*. The paper is available from:

[doi:10.1615/PlasmaMed.2020034526](https://doi.org/10.1615/PlasmaMed.2020034526)

Contact:

Prof. F. Reniers, Université Libre de Bruxelles

freniers@ulb.ac.be

New Resources

Please submit your notices for new resources (e.g., newly published special issues, new databases, new reviews) to iltpc-central@umich.edu.

Career Opportunities

- **PhD Candidate Vacancy, Maastricht University, The Netherlands: A CO₂ Free Future – Sustainable Hydrogen and Carbon Nanomaterials Production in Methane Plasma**

Fossil fuels provided the cheap energy that catalyzed global development in the previous two centuries which came at the expense of environmental effects, such as the growth of anthropogenic CO₂ emissions leading to climate change. In this project, we will investigate a route in which CO₂-neutral hydrogen is produced by “decarbonization” of methane with renewable energy while an economic benefit is created by the co-production of high-value carbon that can be used as a construction material.

In this project, we will investigate total plasma based methane pyrolysis to optimize and control the value of the carbon products and at the same time economically producing hydrogen. We will generate understanding of reactor transport and energy dissipation using in-situ laser diagnostics to quantify reactor temperature and to observe carbon nucleation and growth.

PhD candidate requirements: *Applicant must be from a Chinese University.* Candidate should graduate in 2021 with a Master’s degree in either physics, chemistry, chemical engineering, mechanical engineering, or other engineering or physical science disciplines. Preference will be given to students with knowledge or experience in laser diagnostics, plasma chemistry or physics, or hydrocarbon chemistry. Due to the funding through the **CSC program**, we will preferentially select candidates from “Double First class” universities, although other strong applicants are encouraged to apply. A high level of English speaking and writing ability is essential.

More information on the CSC program: <https://www.maastrichtuniversity.nl/china-csc-scholarships>

Contact:

Dr. Tom D. Butterworth, t.butterworth@maastrichtuniversity.nl

Prof. G. J. van Rooij, g.vanrooij@maastrichtuniversity.nl

Circular Engineering Group, Maastricht University, The Netherlands

- **Faculty Position in Theoretical/Computational Low Temperature Plasma Physics
Physics Department, Auburn University (Auburn, Alabama, USA)**

The Physics Department at Auburn University is now seeking a highly qualified individual for a tenure-track faculty position, at the level of Assistant Professor or Associate Professor, in the area of theoretical and/or computational low temperature plasma physics. The successful candidate will join a vibrant department that conducts research in four research clusters: atomic physics, biophysics, condensed matter physics, and plasma physics. In particular, the Auburn Physics Department has a large, active plasma group that includes ten faculty members that pursue experimental, theoretical, and computational research in fusion, space plasmas, dusty/complex plasma, and an emerging effort in low temperature plasmas. We are seeking a strong candidate who will build strategic collaborative relationships with the Physics faculty, the plasma group, and other researchers both on- and off-campus. Candidates should have a strong research record of computational and/or theoretical research in basic and low temperature plasma science relevant to emerging applications. The successful candidate will be expected to: (1) demonstrate strong leadership potential in the area of plasma physics, (2) establish an independent research program at Auburn University, (3) provide direction to undergraduate and graduate students and post-doctoral researchers in

plasma physics, (4) establish interdisciplinary research collaborations to broaden the impact of plasma physics and (5) conduct excellent instruction at the undergraduate and graduate level in the Physics curriculum. Applicants must possess a Ph.D. or equivalent degree in physics or a closely related field at the time employment begins. Post-doctoral research or equivalent experience is highly desirable. Excellent written and interpersonal communication skills are required.

Auburn University, the College of Sciences and Mathematics (COSAM), and the Physics Department have a collegial, collaborative environment. A primary goal for our College and the Physics Department is the development of inclusive environment by strengthening the diversity among our faculty, staff, and student body. The Physics Department has a community of approximately 45 faculty, lecturers, and staff, 65 undergraduate students, and 48 graduate students. We are particularly interested in receiving applications from persons in groups that have been historically underrepresented in physics.

Applications must include a cover letter, curriculum vitae, a statement of teaching philosophy, and a statement of research. All applications must also provide a statement which describes how your past and/or potential contributions in teaching, research, and/or service will serve to advance our mission of creating an inclusive environment. Please visit the COSAM webpage that describes content for this statement: https://aub.ie/cosam_inclusion.

Candidates must apply online at: <https://www.auemployment.com/postings/19552>

The review of applications will begin on **December 1, 2020** and will continue until the position is filled. The desired starting date is August 16, 2021.

Contact:

Prof. Ed Thomas
Auburn University
etjr@auburn.edu

- **Postdoctoral Position at Alabama Agricultural and Mechanical University in Low Temperature Plasma Applications in Agriculture (Normal, Alabama USA)**

A postdoctoral position is available in the Department of Biological and Environmental Sciences at the Alabama Agricultural and Mechanical University (AAMU). The candidate would work in the area of atmospheric pressure plasma treatment of agricultural produce and products with a focus on determining the mode of action. Specifically, the postdoctoral fellow will conduct objective oriented research in plasma applications in seeds and plants of economic crops species; poultry meat and eggs, and nitrogen enriched plasma water for use as a fertilizer and as a biocide. The selected candidate will be a member of the NSF EPSCoR interdisciplinary and multi-institutional team (<http://www.uah.edu/cpu2al>), and will work under the supervision of the project directors at AAMU and the University of Alabama in Huntsville (UAH), and any other collaborator(s). The postdoctoral fellowship is initially for one year subject to annual renewal for two additional years based on candidate's productivity and availability of funds.

The candidate will be expected to conceptualize, design, and conduct experiments that give rapid results with potential for in-depth studies leading to a deeper understanding of the mode of action. The candidate will work closely with collaborators at UAH and private industry to address challenges in designing and building appropriate plasma equipment to suit the research objectives. The postdoctoral fellow is expected to produce high-quality journal publications, consult and assist other students in the lab, work with the PIs on proposals, and interface with other faculty and staff.

Qualifications: A PhD in biophysics, plasma chemistry, agricultural science, or related fields with a strong background in biophysics is required. Preference will be given to candidates with prior experience in plasma applications in agriculture and soft biomatter. Good written and verbal communication skills are expected.

Applicants should send: 1) a letter of application describing how their training and experience qualify them to fulfill the requirements of this position; 2) a current curriculum vitae; 3) official transcript of all academic qualifications; and 4) names of three professional references with their e-mail addresses and telephone numbers to:

The Office of Human Resources, P. O. Box 305, Alabama A&M University, Normal, AL 35762. Refer to Position 174982. Minorities and women are encouraged to apply.

Contact:

Prof. S. R. Mentreddy

Department of Biological and Environmental Sciences Alabama A & M University
srinivasa.mentreddy@aamu.edu

- **Postdoctoral Research Associate in Experimental Low-Temperature Plasma Science and Engineering at the University of Notre Dame (South Bend, Indiana, USA)**

Applications are invited for a Postdoctoral Research Associate position at the University of Notre Dame in Notre Dame, Indiana (United States) in the research group of **Prof. David B. Go**, starting on or around January 2021.

The position is nominally in the area of plasma-assisted additive manufacturing, but applicants may also propose their own line of research if they are interested in pursuing an independent research path. Applicants should have a PhD (or anticipate receiving a PhD by the time of the appointment) in an appropriate engineering or science discipline and experience in experimental plasma science (primarily at atmospheric pressure), including, but not exclusive to, developing plasma systems, application of plasma devices, and/or plasma diagnostics. We are especially interested in candidates who will contribute to the diversity and excellence of the University's academic community. Successful applicants will have a track record of research contributions and be effective at independent research, mentoring undergraduate and graduate researchers, and written and oral communication.

General inquiries and applications should be sent to **Prof. David Go** (dgo@nd.edu). Applications should include a cover letter that includes experience, career aspirations, and research interests, a CV, and contact information for at least two professional references, all within a single PDF.

Contact:

Prof. David Go

University of Notre Dame
dgo@nd.edu

- **PhD Position - "Characterization of charge carriers in technological relevant plasmas" at the Leibniz Institute for Plasma Science and Technology (INP), Greifswald, Germany**

We are looking to recruit at the earliest possible date a PhD student for the topic "Characterization of charge carriers in technological relevant plasmas" for the department of Plasma Diagnostics. The topic of your PhD is the investigation of fundamental questions concerning charge carrier densities and their energy distribution functions in technological relevant plasmas. This includes low-pressure plasmas as well as atmospheric pressure plasma jets. In view of the challenges, especially for the latter, conventional methods for the characterization of charge carriers in plasmas, such as Langmuir probes, will be extended by the application of modern optical methods such as MW interferometry and THz spectroscopy.

Our institute ranks among the largest and most modern institutions in the field of low-temperature plasmas worldwide. In an international working environment, we conduct socially relevant research within our core areas Materials & Energy and Environment & Health. Currently the INP employs about 200 scientists and staff at three locations (Greifswald, Rostock, and Karlsburg). For further information, please visit our website at www.leibniz-inp.de.

Full details of the advertised position can be found under the following link:

<https://inp-greifswald.dvinci-easy.com/en/jobs/20224/0370-phd-student-fmd-for-the-topic-characterization-of-charge-carriers-in-technological-relevant-plasmas>.

Applicants should send a cover letter, CV, copies of academic degrees, and letters of reference to **Mrs. Gabriele Lembke** (bewu@inp-greifswald.de) giving the keyword „0370 PhD Student for Plasma Diagnostics” - *preferably via our online application* – until **25 October 2020**.

Contact:

Dr. Jean-Pierre van Helden

INP Greifswald

jean-pierre.vanhelden@inp-greifswald.de

• **Multiphysics Solver Development Engineer – Plasma (Huntsville, Alabama, USA)**

ESI Group, a dynamic and diversified company specializing in CAE solutions for virtual manufacturing and prototyping, seeks an expert with a development background in the computational modeling of low temperature technological plasmas. The expert will be part of the Solver development group and participate in the development, modeling support, maintenance, and extension of our flagship multi-physics product – the ACE+ Suite. The plasma modeling team is currently working on non-equilibrium plasmas and their effects in reactor and feature scale models.

Essential Functions

- Work collaboratively with experienced computational physics research and development staff to advance the state-of-the-art in plasma modeling to make an impact in the semiconductor, automotive and aerospace industries.
- Design, and develop new algorithms and methodologies applicable to high performance computation of plasmas and electromagnetics in complex geometries, chemistries and process conditions using fluid, particle, and hybrid approaches.
- Create validation and benchmarking problems to test and verify new developments and existing capabilities.
- Provide high quality consultation and support to customers related to new developments and capabilities.
- Propose, define, and contribute to new research topics relevant to customer needs and demands.
- Participate in software engineering in relation to development and maintenance of software products.

Education and Skills

- A PhD in plasma physics or engineering with development experience in plasma modeling, or an M.S. Degree in a relevant field with 5 or more years of directly relevant experience.
- Experience in the modeling and simulation of materials processing involving plasma is required.
- Industrial experience in the modeling and simulation of low temperature plasmas is highly desired.
- Reactor scale and feature scale modeling knowledge and experience is preferred.
- Experience in source code development for solving plasma governing equations is required.
- Hands-on experience modeling plasma chemistry (volumetric and surface reactions, involving ions and electrons) is required.
- Working experience with C/C++/F90 is preferred.
- Understanding of parallel programming and optimizing code for high performance is required.
- Knowledge of DSMC, molecular dynamics, Boltzmann and particle methods is preferred.

To apply, please submit your resume on this site: <https://esigroup.applicantpro.com/jobs/>.

Contact:

Dr. Ananth Bhoj

Principal Technical Manager

abh@esi-group.com

- **Universidad Carlos III de Madrid invites applications to fill PhD Positions**

ZARATHUSTRA-D1: Three-dimensional modeling of Electrodeless Plasma Thrusters

ZARATHUSTRA-D2: Design and characterization of a Magnetic Arch EPT

Three-dimensional modeling of Electrodeless Plasma Thrusters (ZARATHUSTRA-D1): Electrodeless plasma thrusters (EPTs), such as the Helicon thruster and the ECR thruster, promise many advantages over traditional electric space propulsion systems currently in the market. However, the complex physical processes involved in their operation are still not well understood. In particular, a robust theory of the electromagnetic heating of the electrons in the magnetized plasma and their anomalous transport perpendicular to the magnetic lines is still missing. The selected candidate will develop a three-dimensional, multi-fluid simulation code coupled with an electromagnetic solver to model and study the plasma dynamics and the EM fields in cylindrical EPTs and in the new fully-3D “Magnetic Arch Thruster” concept being developed at UC3M.

Design and characterization of a Magnetic Arch EPT (ZARATHUSTRA-D2): Current thruster geometries have inherent limitations that impair performance. Seeking new thruster designs, magnetic topologies, and operating principles is essential to unblock EPT development and pave the way toward a new generation of efficient and versatile space plasma thrusters. The selected candidate will design, build and test a thruster prototype based on the “Magnetic Arch Thruster” concept (see patent ES2733773), to assess its potential advantages with respect to existing cylindrical EPT geometries using state-of-the-art lab equipment and diagnostic systems.

These contracts will be funded by the recently awarded ERC Starting Grant project ZARATHUSTRA (Revolutionizing advanced electrodeless plasma thrusters for space transportation). The candidate will join the Space Propulsion and Plasmas Team (EP2, <http://ep2.uc3m.es/>) at UC3M, and collaborate closely with other PhD students and researchers fully dedicated to the project under the supervision of Dr. M. Merino.

Requirements and desirable profile:

- MSc holder (or MSc student with 60 ECTS passed at contract’s signature).
- Background: Aerospace Engineering, Plasma Physics, Fluid Dynamics, Applied Mathematics, and/or Scientific computing. Excellent candidates from other disciplines are also invited to apply.
- Outstanding academic record; critical & creative thinking.
- International experience; team-working and communications skills.
- Good proficiency in English (oral & written).
- Ability to deal independently and proactively with scientific and engineering challenges.

What we offer:

- 3-year contract (with optional 1-year extension); annual gross salary in the 20k – 22k € range.
- Become part of a young, dynamic, highly qualified, collaborative team.
- Flexible working environment and schedule.
- Opportunity to travel to international conferences to present research results, and research internships abroad.
- Health coverage under the National Health System.

How to apply:

Send applications to mario.merino@uc3m.es indicating in the e-mail subject the reference “ZARATHUSTRA-D1” or “ZARATHUSTRA-D2”. Attach the following documents in PDF format:

- CV (max. 4 pages), including relevant professional experience and knowledge.
- Copy of diploma and grades from previous university studies.
- A motivation letter of experience, interests, and research goals (max. 1 page).
- The contact information for two references (will be contacted during the hiring process).

Submission of applications is due by **October 15th, 2020**. Later applications may be considered until the vacancy is occupied. Contract will begin in January 2021, though earlier/later start date can be agreed. More information at: <http://mariomerino.uc3m.es/>.

Contact:

Prof. Mario Merino

Universidad Carlos III de Madrid

mario.merino@uc3m.es

Collaborative Opportunities

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

Disclaimer

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