HAKONE XIX

19th International Symposium on High Pressure Low Temperature Plasma Chemistry

August 23-27, 2026
Montréal, Canada

SYMPOSIUM BOOKLET

www.hakone-symposium.org

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Université de Montréal et du monde.

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Institut Courtois
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Michigan Institute for Plasma Science and Engineering

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The HAKONE XIX conference will be held in Complexe des Sciences of Université de Montréal, also known **Campus MIL**. The campus is at walking distance (5 min.) from to 2 métro (subway) stations of the **Blue line: Outremont** or **Acadie**.

Address: 1375 Avenue Thérèse-Lavoie-Roux, Montréal (Qc), H2V 0B3, Canada.

What happens in Building B

Registration, welcome reception, exhibition, coffee breaks, poster session, lunches

What happens in Building A

Presentations (room A-3502 on Monday AM, room A-4502 Monday PM - Thursday AM)

PROGRAM

	Sunday (23/08)	Monday (24/08)	Tuesday (25/08)	Wednesday (26/08)	Thursday (27/08)
8h00		Registration	Registration	Registration	Registration
8h10					
8h20					
			Session 5 - Chair: A. Bourdon	Session 8 - Chair: E. Carbone	Session 12 - Chair: S. Coulombe
8h30		Opening	Katharina Stapelmann	François Reniers	Tom Huiskamp
8h40					
		Session 1- Chair: R. Brandenburg			
8h50		UKLA - Anne Bourdon			
9h00					
9h10					
9h20			O3-1 J. Pawlat	O5-1 K. Delcourt	O7-1 C. Davis
9h30					
9h40		O1-1 H. Höft	O3-2 A. Gady	O5-2 S. Hekking	O7-2 P-S. Kandjo Ngoubeyou
9h50					
10h00		O1-2 E. Collard	O3-3 T. Murakami	O5-3 A. Patelli	O7-3 J. Jeon
10h10					
10h20		Coffee Break	Coffee Break	Coffee Break	Coffee Break
10h30					
10h40					
		Session 2- Chair: N. Osawa	Session 6 - Chair: M. J. Kushner	Session 9 - Chair: F. Tochikubo	Session 13 - Chair: N. Gherardi
10h50		O1-3 F. Tochikubo	O3-4 J. Letellier-Bao	O5-4 O. Boiko	O7-4 K. Sasaki
11h00					
11h10		O1-4 R. De Meyer	O3-5 E. Hong	O5-5 Y. Jiang	O7-5 M. Böke
11h20					
11h30		O1-5 L. Krös	O3-6 S. Benmoussa	O5-6 R. De Meyer	O7-6 C. Batiot-Dupeyrat
11h40					
11h50		O1-6 J. Kelar	O3-7 H. Stryczewska	O5-7 J. Figueiredo	O7-7 C. van Melis
12h00					
12h10		O1-7 A. Quack	Lunch	Lunch	O7-8 A. Hecimovic
12h20					
12h30		Lunch			Closing
12h40					
12h50					Lunch
13h00					
13h10					
13h20					
			Session 7 - Chair: H. Stryczewska	Session 10 - Chair: J. Profili	
13h30			Stephan Reuter	O6-1 F. Massines	
13h40					
		Session 3 - Chair: N. Naude			
13h50		Atsushi Komuro		O6-2 R. Krumpolec	
14h00	Registration 14h-17h				Lab Visits
14h10				O6-3 Y. Nakagawa	
14h20			O4-1 A. Haroun		
14h30				O6-4 J. Pothier	
14h40		O2-1 J-B. Billeau	O4-2 S. Simon		
14h50				O6-5 L. Sebih	
15h00		O2-2 A. Schicke	O4-3 P-L. Girard-Lauriault		
15h10					
15h20		O2-3 M. Elsheikh	O4-4 L. Cacot	Coffee Break	
15h30					
		Coffee Break	Excursion	Session 11 - Chair: K. Stapelmann	
15h40				O6-6 B. Sadeghi	
15h50					
16h00				O6-7 M. van de Sanden	
		Session 4 - Chair: L. Stafford			
16h10		O2-4 M. Moisan		O6-8 R. Brandenburg	
16h20					
16h30		O2-5 P. Wirth		O6-9 H. Beica	
16h40					
16h50		O2-6 V. Riazantceva		Tansit to downtown by metro (subway)	
17h00					
17h10		O2-7 S. Coulombe			
17h20					
17h30		O2-8 S. Nijdam			
17h40	Welcome Party 17h-19h			Banquet 18h30-22h00	
17h50		Poster Session 18h00-20h00			
18h00					
18h10					
18h20					
18h30					
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ACADEMIC PARTNERS

Université de Montréal (https://www.umontreal.ca)

The Université de Montréal is one of Canada's leading French-language research universities and is recognized internationally for its academic excellence and innovation. Founded in 1878, it has grown into one of the largest universities in North America, welcoming tens of thousands of students from around the world. The university offers more than 650 undergraduate and graduate programs across a wide range of disciplines. Université de Montréal is home to world-class researchers who contribute to advances in health, artificial intelligence, environmental science, social sciences, and the humanities. Through its affiliated schools, including Polytechnique Montréal and HEC Montréal, it forms one of the largest centers of higher education in Canada. The university values interdisciplinary collaboration, encouraging students and faculty to address complex global challenges through innovative research. Its diverse and multicultural community fosters inclusion, creativity, and international engagement. Strong partnerships with industry, government, and academic institutions provide students with valuable experiential learning and research opportunities. With a commitment to excellence in education, discovery, and public service, Université de Montréal continues to make a significant impact both locally and globally.

Founded in 1972 with the goal of developing interdisciplinary teaching and research programs, the **Faculty of Arts and Sciences** now offers approximately 300 programs across all levels of study, some of which are unique in Quebec and even in Canada. The faculty emphasizes collaboration among its departments, schools, and institute to align students' interests and educational needs with the evolving expectations of society. As a result, it offers a wide range of program combinations across its three broad academic sectors: Arts and Humanities, Social Sciences and Psychology, and the Natural Sciences.

Institut Courtois (https://institut-courtois.umontreal.ca/)

The Institut Courtois was born of a simple idea and an unabashed dream: to transform scientific research by pursuing non-oriented basic research in state-of-the art facilities. The Institute is therefore dedicated to ambitious open research. At the intersection of new materials, quantum physics and artificial intelligence, the Institut Courtois explores the frontiers of matter by bringing together the latest advances in information technology with research in chemistry and physics. The Institute offers a space for interchange between cutting-edge theoretical and experimental approaches to material properties research. Its innovation ecosystem embraces both distinguished and promising young researchers who have come together at the University of Montreal's MIL campus to push back the limits of knowledge.

Michigan Institute for Plasma Science and Engineering (https://mipse.umich.edu)

The Michigan Institute for Plasma Science and Engineering (MIPSE), sponsored by the University of Michigan College of Engineering, brings together plasma researchers from Michigan universities to investigate fundamental plasma phenomena and translate advances in plasma science into society benefiting technologies. MIPSE supports graduate and undergraduate research through internships and degree programs, provides seed funding to investigate new areas of plasma related science and engineering, fosters interdisciplinary research, connects with industry, sponsors visitors and seminars, and serves as a forum for outreach to the community.

Regroupement québécois sur les matériaux de pointe (https://rqmp.ca)

The RQMP is a network of scientists who collaborate together, with other scientists regionally and internationally, and with industry. Together, they explore and improve advanced materials science, useful for a wide range of technologies. What unites the members of the RQMP is their methods of synthesis, manufacture, characterization and numerical calculation. The RQMP mission is to explore and improve the science of advanced materials underlying the technologies of many sectors through research consultation in the areas that are at the heart of its programming. The RQMP brings together 80 research teams in 3 institutional poles: Université de Montréal/Polytechnique Montréal, McGill University, and Université de Sherbrooke. Together with the student community and research staff, it is a group of 580 people, to which is added about thirty collaborating members from other institutions, government research centers and industrial partnerships

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McGill energy is McGill University's Centre for interdisciplinary research, innovation, partnerships, knowledge mobilization, and outreach on sustainable energy. McGill energy embraces the full complexity of the energy transition and provides a home for diverse approaches and ideas. We bring together a diverse community of researchers from across faculties and disciplines, allowing us to offer a 360-degree perspective on today's energy challenges and to help drive the transition to sustainable energy systems.

We aim to:

- Generate new knowledge, develop innovative technologies and solutions
- Train the next generation of energy thinkers and doers
- Contribute meaningfully to public dialogue and energy literacy

Réseau Québécois sur l'Énergie Intelligente (https://www.rqei.ca/)

Le Réseau québécois sur l'énergie intelligente (RQEI) rassemble les expertises québécoises en transition et innovation énergétiques. Il soutient la recherche collaborative en électrification, hydrogène, bioénergies, stockage et systèmes intelligents, et contribue à faire émerger des solutions durables pour le Québec.

The Réseau québécois sur l'énergie intelligente (RQEI) is a province-wide research network that brings together experts in energy transition and smart energy technologies across Quebec. It promotes collaboration among universities, research laboratories, industry, and public organizations to accelerate innovation in sustainable energy. The network research activities are organized around three main themes: green and intelligent transportation systems, intelligent management of stationary energy systems, and energy storage and conversion. RQEI supports interdisciplinary research, knowledge transfer, and technology commercialization. It also provides funding opportunities, training, networking events, and industry partnerships for students and researchers. By fostering collaboration between academia and industry, the RQEI contributes to the development of innovative solutions that support Quebec's clean energy transition and strengthen the province's leadership in sustainable energy technologies.

Springer (https://link.springer.com/)

Springer is one of the world's leading academic publishing companies, specializing in science, technology, medicine, and the social sciences. It publishes thousands of peer-reviewed journals, books, and reference works each year. Springer serves researchers, educators, students, and professionals by disseminating high-quality scientific knowledge worldwide. Its portfolio includes more than 3,000 journals and 300,000+ books, covering a wide range of disciplines. The publisher supports both subscription-based and open-access publishing models. Springer is known for rigorous peer review, editorial quality, and global accessibility through its digital publishing platform. It collaborates with universities, research institutions, and scientific societies to advance scholarly communication. Springer also provides resources such as book series, conference proceedings, and professional reference materials. As part of Springer Nature, it plays a major role in promoting innovation, research integrity, and the global exchange of scientific knowledge.

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Company Overview

As a world-renowned vacuum pump manufacturer and leading provider of vacuum technology, **Pfeiffer Vacuum+Fab Solutions** delivers innovative solutions and high-tech vacuum equipment designed for high vacuum and ultra-high vacuum applications. Pfeiffer Vacuum+Fab Solutions offers best-in-class solutions tailored for semiconductor, analytics, research, and various other applications, providing turnkey solutions, exceptional service, and high-quality products.

Pfeiffer Canada is part of the Busch Group, a global leader in vacuum technology, uniting two expert brands: Pfeiffer Vacuum+Fab Solutions and Busch Vacuum Solutions. Together, they deliver comprehensive vacuum solutions and services across all industries in Canada, supported by four dedicated Canadian service centers.

Key Capabilities & Solutions

- **Turnkey Vacuum Solutions:** High-vacuum and ultra-high vacuum equipment designed for high-precision analytical and industrial processes.
- **Comprehensive Industry Applications:** Dedicated expertise in semiconductor manufacturing, analytics, and academic research.
- **National Service Network:** Four strategically located Canadian service centres in Montréal, Toronto, Calgary, and Vancouver.

Contact Information

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PLASMA MATTERS

Company Overview

Plasma Matters B.V. is a specialized B2B software company focused on plasma modeling and numerical simulation. The company develops and maintains **PLASIMO** (**PLAsma SImulation & MOdeling**), a comprehensive platform for predictive simulation of a wide range of plasma sources operating under diverse conditions. By combining state-of-the-art multi-physics modeling with extensive expertise in plasma science, Plasma Matters enables industrial and research partners to optimize plasma processes, design innovative plasma sources, and accelerate technology development.

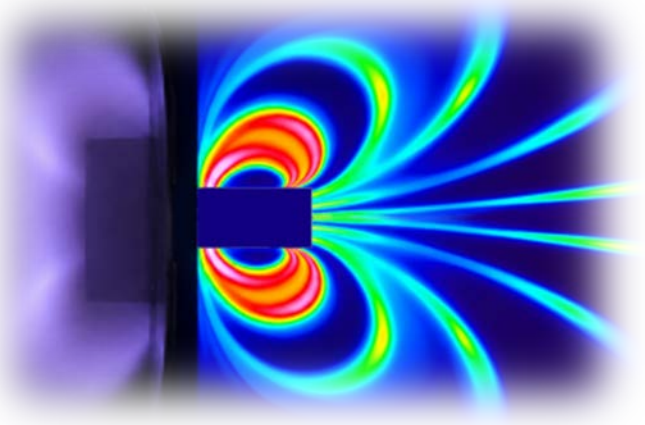
By combining advanced simulation software with deep domain expertise, Plasma Matters bridges the gap between plasma science and engineering practice. The company supports the complete innovation cycle — from understanding plasma behavior and validating new concepts to virtual prototyping, reactor optimization, and technology scale-up.

Core Activities & Capabilities

- **Software Development:** Maintenance and evolution of PLASIMO and custom physical modeling engines.
- **Process Optimization & Virtual Prototyping:** Modelling, reactor design, and scale-up assistance for plasma source developers.
- **Consulting & Training:** Expert consulting and tailored educational training in numerical plasma modeling.

Target Applications & Markets

Semiconductor manufacturing, materials processing, pharmaceuticals, electronics, energy, and environmental technologies. Customers include universities, research institutes, equipment manufacturers, and high-tech industries.



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KALEGO SOLUTIONS

Company Overview

Kalego Solutions develops next-generation plasma technologies designed to make industrial processes more efficient and sustainable. Our expertise is based on atmospheric pressure plasma, which enables nanoscale surface modification through durable, chemical-free treatments that can be seamlessly integrated into existing production lines.

O*fficial North American partner* of **Roplass**, **AcXys Plasma Technologies**, and **Nadir Plasma**.

Core Offerings & Technologies

- **1. Consulting and Sample Testing:** Performance evaluation of plasma treatments for industrial applications.
- **2. Precision Surface Treatments:** Improving adhesion between dissimilar materials (fluoropolymers, metals, ceramics) as an eco-friendly alternative to industrial primers. Functional coatings including anti-fog, hydrophilic, and hydrophobic treatments.
- **3. Modular Reactor Sales & Rental:** Modular plasma systems for research and production:
  - **Dual-Frequency Cold Plasma:** Advanced argon plasma jet for sensitive materials. Eliminates electric arcs/erosion, ideal for biomedical & life sciences.
  - **Diffuse Coplanar Surface Barrier Discharge (DCSBD):** Homogeneous ultra-cold plasma (100–200 W/cm²) for high-speed roll-to-roll production, textiles, glass lamination, and printed electronics.
  - **Blown Arc Plasma-Jet:** Patented RF blown arc technology for SiOx deposition (50–1000 nm), metal/glass activation, and composite plasma ablation (CPA).

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Website	www.kalegosolutions.com
Service Locations	Laboratory: 10, rue de l'Espinay, E0-170, Québec, QC, G1L3L5, CA

LIGHT MACHINERY

Company Overview

For over two decades, LightMachinery has produced some of the flattest, most precisely figured optical surfaces in the world. Our **HyperFine spectrometers**, etalons, and VIPA elements are trusted by research institutions, national laboratories, and industrial R&D groups worldwide.

Diagnostic Challenges & Solutions

High-pressure, low-temperature plasma research demands **high spectral resolution** to extract gas temperatures and electron densities from line shapes (e.g., resolving Stark and van der Waals broadening of Hα at 656.3 nm or fine-structure splitting of He I near 492.2 nm). The **HyperFine Spectrometer Series** delivers picometer-class resolution with no moving parts in a compact, high-throughput package. Its VIPA-based architecture captures the entire spectral region simultaneously, enabling single-shot, **sub-50 pm measurement of line profiles** in dynamic and transient plasmas.

Core Technologies & Applications

- **Proprietary Manufacturing:** Built on Fluid Jet Polishing process, achieving sub-nanometer optical precision.
- **Applications:** Plasma diagnostics, line-shape and broadening analysis, gas temperature and electron density measurements, combustion diagnostics, and time-resolved spectroscopy.

Contact Information

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ULRICH KOGELSCHATZ AWARD

Modeling and simulation of atmospheric pressure low-temperature plasmas

Anne Bourdon[1]

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For the 2026 Ulrich Kogelschatz Lecture Award, the focus will be on the modeling and simulations of dielectric barrier discharges at atmospheric pressure. From his early work on ozone formation, U. Kogelschatz's work contributed a lot to improve the knowledge on dielectric barriers discharges [1,2] studied for a wide range of applications.

In this lecture, we focus on two different set-ups chosen as testbeds for the study of the physics and discharge dynamics of dielectric barrier discharges. First, a point-to-plane geometry in atmospheric pressure air in which a dielectric layer is set as an obstacle between both electrodes [3] is presented. Second, a helium kHz plasma jet powered by rectangular pulses of applied voltage impacting a target [4] is discussed. In the dielectric tube of the plasma jet, the dielectric surface contributes to the "guiding" of the discharge.

Different modeling and simulations approaches are presented, along with recent efforts for direct comparisons between simulations and measurements using advanced diagnostics tools. For both studied set-ups, we discuss the most fundamental physical quantities determining discharge dynamics, such as the electric field, the mean electron energy and the electron number density, as well as the charging of targets. Finally, the impact of a better understanding of dielectric barrier discharges on the further to further improvements of existing applications and new applications is discussed.

References:

[1] U. Kogelschatz., Plasma Chem. Plasma Process. **23** (2003)
[2] U Kogelschatz, J. Phys. D: Appl. Phys. **50** 051001 (2017)
[3] F. Pechereau et al. Plasma Sources Sci. Technol. **25** 044004 (2016)
[3] P. Viegas et al. Plasma Sources Sci. Technol. **31** 053001 (2022)

Physicochemical dynamics of atmospheric pressure streamer discharges: Numerical modeling and electric field measurement in DBDs

Atsushi Komuro[1]

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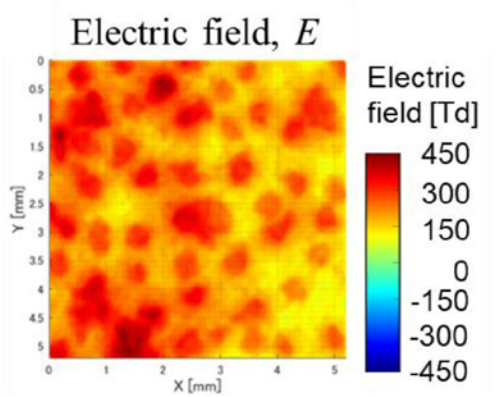
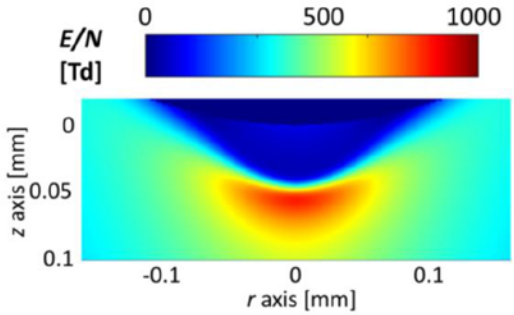
Streamer discharges are used in gas-treatment applications such as exhaust-gas purification, ozone generation, and semiconductor processing. Their behavior is governed by coupled transient phenomena involving electric fields, charged-particle transport, and plasma chemistry, which makes reactor optimization and scaling difficult. A better understanding of atmospheric-pressure streamer dynamics is therefore important for plasma reactor analysis and design. Although numerical simulations and experimental diagnostics of streamer discharges have advanced substantially, direct comparison between them remains limited, especially for quantities closely related to discharge physics. Among these, the electric field is particularly important because it governs electron energy, reaction rates, and plasma-chemical evolution.

This study presents our recent work on atmospheric-pressure streamer discharges using a combined approach based on electric-field measurement and self-consistent numerical modeling. Our earlier work focused mainly on point-to-plane streamer discharges, and more recently this approach has been extended to dielectric barrier discharge (DBD) systems that are more closely related to practical reactors. On the experimental side, we measured the net electric field in a parallel-plate DBD with high spatiotemporal resolution, as shown in Figure 1(a). In parallel, numerical simulations were developed to analyze streamer initiation, propagation, and branching under atmospheric-pressure conditions. Figure 1(b) shows a simulated electric-field distribution during primary streamer propagation in a point-to-plane DBD.

By comparing measured and simulated electric-field distributions, we aim to refine the physical interpretation of atmospheric-pressure streamer discharges and to assess the validity of plasma-chemical reaction models used in numerical analysis. This invited talk presents an overview of our recent work on electric-field diagnostics and numerical modeling for gas-treatment reactor studies.



(a)



(b)

Figure 1 (a) Experimentally obtained gap electric field measurement in parallel-plate dielectric barrier discharges in air [1]. (b) Simulated electric field during primary streamer propagation in point-to-plane dielectric barrier discharges in air [2].

References:
[1] Lu Y, Ono R and Komuro A *Plasma Sources Sci. Technol.* **33** 04LT01 (2024).
[2] Yoshida K, Komuro A and Ando A *J. Phys. D: Appl. Phys.* **54** 315203 (2021).

Plasma Endpoint Detection for Wound Healing

Katharina Stapelmann[1], Jonathan E. Thomas[1], Kristina Pattison[1], Suneel Kumar[2], Francois Berthiaume[2], and Vandana Miller[3,4]

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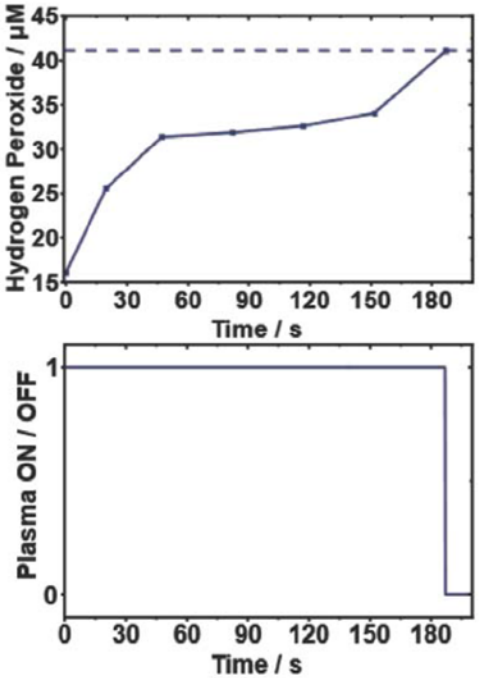
Cold atmospheric pressure plasma (CAP) is a promising treatment for chronic and hard to heal skin wounds and has been successfully used in human wound care. However, CAP dosing remains empirical because there are no immediate visible changes during the brief treatment time and biological outcomes are recapitulated hours to days later. While redox-relevant reactive oxygen and nitrogen species (RONS), the proposed effectors of CAP, can be measured with bulky and expensive equipment in the lab, it is impractical for a clinical setting. Two readily detectable RONS, H_2O_2 and NO, are physiologically relevant species. H_2O_2 serves as a key signaling molecule in regulated cascades that activate various metabolic processes involved in wound healing [3]. NO has antimicrobial properties and is an endogenous messen- ger that promotes angiogenesis, cell migration, and tissue remodeling [4]. ORP (oxidation-reduction potential) measures the overall redox state and the balance between oxidants and reductants. Besides measurements of CAP analytes, real-time monitoring of cellular effects could also serve as an important parameter for device control. Changes in calcium homeostasis are among the earliest changes in cells in response to environmental stressors. Ca^{2+} is a cen- tral regulator of proliferation, migration, and differentiation, as well as angiogenesis [5]. We report on the use of electro-chemical wire sensors to measure *in situ* H_2O_2 [1], ORP [1], NO [2], and Ca^{2+} [2] in real time in a wound bed. Coupled with a microcontroller, the sensor measurements can be used to control the CAP device, in order to terminate treatment once a threshold value is reached, e.g., when a desired concentration is reached with exceeding safe levels of H_2O_2. The controller was challenged and validated during CAP treatment of dorsal wounds on mice with three CAP devices: a 10 mm diameter volume DBD, a 5 mm diameter volume DBD, and a surface DBD.



In situ H_2O_2 measurement (top) and PWM signal (bottom) indicating plasma ON/OFF state. The controller terminates treatment once the setpoint is reached..

References:

[1] J. Thomas, S. Kumar, G. Karkada, J. Sutter, et al., *Commun Eng, (2025)*
[2] J. Thomas, K. Pattison, S. Kumar, G. Karkada, et al., *Plasma Chem. Plasma Process.*, **46**(4) (2026)
[3] J. Kanta, *Acta Medica (Hradec Kralove),* **54**, 97 (2011)
[4] B. Witte, A. Barbul, *Am. J. Surg.*, **183**, 406 (2002)
[5] R. Alessandro, L. Masiero, L. Liotta, E. Kohn, *In Vivo,* **10**, 153 (1996)

Control and diagnostic-based tailoring of plasma reactivity in health, environment, and agriculture

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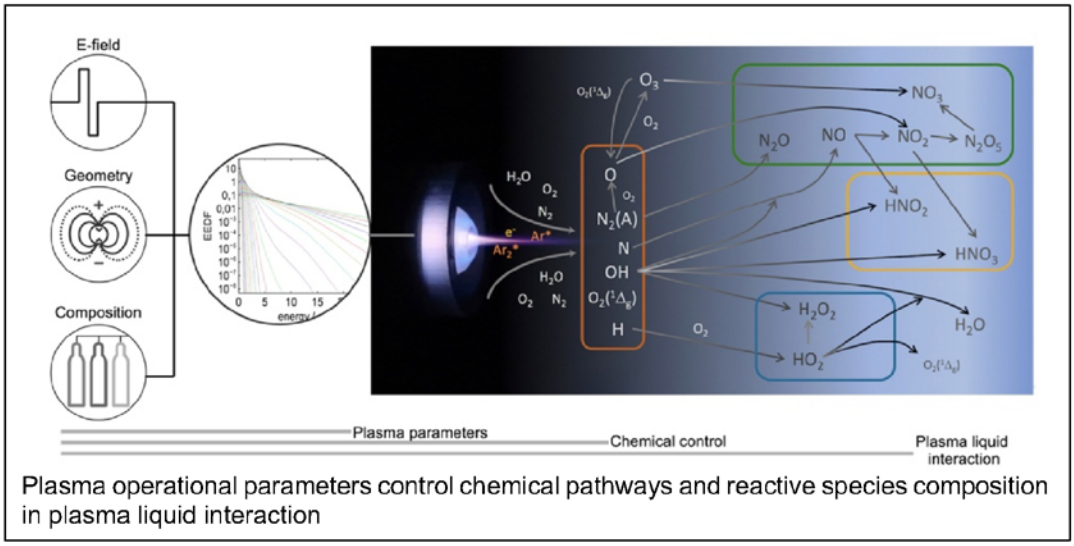
Cold plasmas play an increasingly important role in applications in health, environment, and agriculture. Especially plasmas interacting with liquids are studied in research labs worldwide [1, 2]. The benefits of plasma liquid systems are on-demand use as well as the potential to tailor the plasma chemical pathways to the desired application, for which a fine control over the plasma generated reactive species composition will need to be mastered.

The presentation explores how designing electric excitation, reactor geometry, and gas composition tailors the plasma reactivity and for the case of plasma liquid interaction, the chemical composition of liquids. The plasma's reactive species generation is characterized regarding the electric field, the atomic and molecular ground state and excited state species, as well as the flow field employing advanced diagnostics of ultrafast and ns laser-based spectroscopy as well as absorption spectroscopy and flow field imaging techniques.

Results demonstrate how tailored plasma chemistry effectuates the selectivity of plasma cancer treatment and wound healing [3] and increases energy efficiency in environmental applications for CO_2 dissociation [4], providing educts for added-value chemicals. In agricultural applications such as plasma assisted hydroponic systems, tailored plasma chemistry provides plants with nitrogen nutrients and at the same time kills plant pathogens [5].



Plasma operational parameters control chemical pathways and reactive species composition in plasma liquid interaction

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[3] Project PlasmaFlow (FWO-FRQ funding): S. Reuter, A. Bogaerts, S. Coulombe, Th. Gervais, D. Rosenzweig, D. Boffito
[4] Project Planet - Agriculture (Alliance): S. Reuter, E. Bédard, J. R. Tavares, F. Sirois, A. Haroux, M. Doidge, C. Coté, G. Majeau Bettez, F. Sirois, C.C. Clement, Corey Ellis, M. Skulinova, M. Dorais
[5] Project Planet - CO2: S. Reuter, D. Seletzkiy, Th. Mussenbrock, I. Korolov

New perspectives of dielectric barrier discharges for the deposition of thin films

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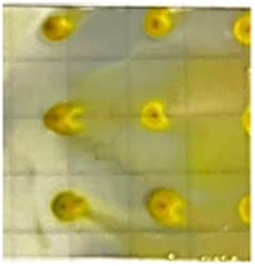
Dielectric barrier discharges (DBDs) allow generating atmospheric plasma at or near room temperature. For decades the main industrial application was for ozone generation thanks to the Siemens process [1]. Applications for surface modifications came later, first for surface activation. Deposition of coatings remained confidential, due to the poor control of the quality of the films. Indeed, the very small mean free path at atmospheric pressure leads to species with very low energies, and random processes due to moving filaments often occur. Taking advantage of the room temperature of DBDs, fragile surfaces such as polymers could be modified. Additionally, DBDs operating at atmospheric pressure do not require vacuum systems, and such processes could therefore present some economic advantages, as well as some positive input in the development of responsible sustainable surface engineering [2].

Thanks to decades of research, dielectric barrier discharges can now be used to deposit more and more sophisticated coatings. The talk will present, through selected examples, some current developments of DBDs for the deposition of organic and inorganic coatings.

We will show that by tuning the precursor chemistry and by controlling the plasma phase, one can design organic coatings with dedicated chemistries [3]. For years, achieving crystalline inorganic coatings using cold atmospheric plasma was challenging. We will show that, nowadays, one can deposit crystalline oxides [4], and that one can tune the average size of crystals [5]. Patterned coatings are usually achieved using mask techniques or laser addition. DBDs can nowadays be used to synthesize in a single step, without mask, chemically patterned organic and inorganic coatings [6,7]

Finally, the talk will explore the current limits of atmospheric DBDs for the deposition of thin films, including limits due to the low mean free path in the gas phase, the low energy of incoming particles, the limits of the Yasuda parameter approach, positive and negative streamer interferences in the polymerization and ablation process, effect of the nature of the inert plasma gas used.

Immobilized filaments in a DBD used to deposit chemically patterned inorganic and organic coatings.



Localized crystalline V_2O_5 coatings

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The scalability of streamer discharge generation for industrial air purification

Tom Huiskamp[1], Chiel Ton[1], Mohsen Mortazavi[1], Bas A. S. Dekker[1] and Guus J. M. Pemen[1]

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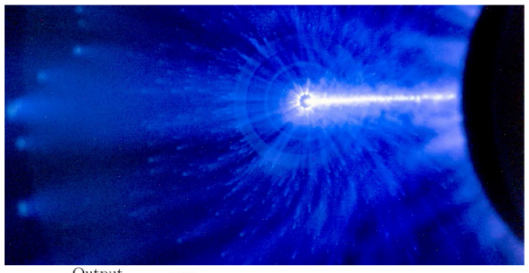
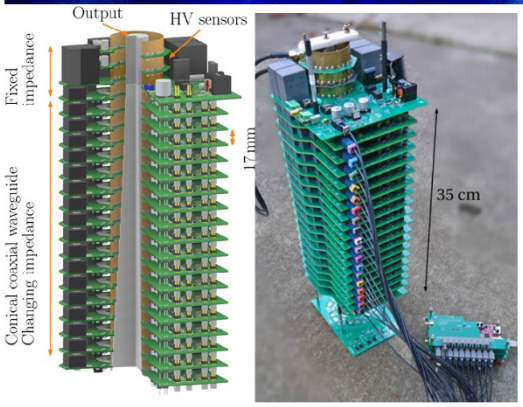
Streamer discharge generation by nanosecond high-voltage pulses in a cylinder-wire reactor is proven as an efficient method for air purification [1]. However, to upscale this technology to wide-spread use in industry, we need to answer the crucial question: which way of upscaling is the most efficient? Previous studies have shown that for this application short rise times and pulse durations are beneficial, but a large parametric study on optimizing reactor sizes and voltages over a very wide range of electrical parameters and physical dimensions has never been performed. To find an optimal scale for industrial application of these discharges, we have performed such a study.

Central in this study is to find what works best when upscaling; a few very large plasma reactors operated at high voltage (>100 kV), many plasma reactors operated at low voltages (<20 kV), or an in-between solution? Therefore, we tested with small cylinder-wire reactors to very large reactors (16-400mm) over a wide range of pulsed voltages (from a few kV to well over a hundred kV) with rise times in the order of tens of nanoseconds and pulse durations in the order of several tens to hundreds of nanoseconds. The resulting streamer discharges are inspected and measured using ICCD imaging, UV spectroscopy and electrical diagnostics with the aim of investigating (and optimizing) ozone generation.

A second theme in this contribution is to give an overview of what is required from a pulsed-power point of view when upscaling plasma air-purification applications. When we find which reactor diameter and pulse parameters work best, what kind of pulse source would be useful for such an operating regime? This is a story of how we went from spark-gap based systems to modern solid-state solutions that can cost-effectively scale to large plasma systems [2,3].





Top: streamer discharge generated with 400-kV pulses in a 400-mm wire-cylinder reactor. Bottom: 20-kV arbitrary waveform, solid-state, nanosecond pulse generator for transient plasma applications [2].

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CONTRIBUTED ORAL PAPERS (Building A)

Paper	Authors	Title
Session 1 [Monday AM, A-3502 building A]: Chair: R. Brandenburg		
Invited-I1	A. Bourdon	Modeling and simulation of atmospheric pressure low-temperature plasmas
O1-1	H. Höft, C. Flores, K.-D. Weltmann, M. M. Becker	Analysis of Spatio-Temporal Ignition Patterns in Sinusoidal-Driven Dielectric Barrier Discharges in a Multi-Filament Arrangement
O1-2	Eliot Collard, Antoine Belinger, Nicolas Gherardi, Nicolas Naudé, Simon Dap, Hubert Caquineau	Revisiting the memory effect in diffuse Nitrogen DBD using a fluid modeling approach
Session 2 [Monday AM, A-3502 building A]: Chair: N. Osawa		
O1-3	Fumiyoshi Tochikubo, Takuto Nozawa, Yusuke Nakagawa	Numerical Study of Filamentary Dielectric Barrier Discharges in Dry Air: Effects of Simulation Parameters and Model Dimensionality
O1-4	Julie Haton, Robin De Meyer, Antoine Belinger, Nicolas Naudé, Luc Stafford	On the Memory Effect and Discharge Characteristics of a Diffuse Dielectric Barrier Discharge in Various N_2/O_2 Mixtures
O1-5	L. Krös, H. Höft, M. Stankov, D. Loffhagen, J. H. van Helden, R. Brandenburg	Tunable diode laser absorption spectroscopy on a single-filament dielectric barrier discharge in argon at atmospheric pressure
O1-6	Jakub Kelar, Michal Pazderka, David Brodnansky, Martin Karkus, Sebastian Dahle, Zlata Kelar Tucekova	Surface Engineering of Heterogeneous Bio-based Materials: Utilizing a Proprietary Hybrid Surface-to-Volume Dual-Frequency Discharge.
O1-7	Alexander Quack, Lennard Buck, Kerstin Sgonina, Jan Benedikt	Influence of Differently Sized Dielectric Beads on Plasma Properties in Plasma Catalysis
Session 3 [Monday PM, A-4502 building A]: Chair: N. Naudé		
Invited-I2	Atsushi Komuro	Physicochemical dynamics of atmospheric pressure streamer discharges: Numerical modeling and electric field measurement in DBDs
O2-1	Jean-Baptiste Billeau, Denis V. Seletskiy, Svetlana Starikovskaia, Stephan Reuter	Defining the influence of electrical pulse parameters on atmospheric pressure plasma jet chemistry
O2-2	Alexander Schicke, Amira Nouira, Sebastian Burhenn, Steffen Schüttler, Marc Böke, Judith Golda	The impact of metastable atoms on Penning dissociation of CO_2 in an atmospheric plasma jet

O2-3	Mohamed G. Elsheikh, Richard Sydora, Amina Hussien and Ahmad Hamdan	Pulsed nanosecond discharge at heptane-water interface: influence of ambient pressure on bubble dynamics, interfacial instability, and emulsification efficiency
Session 4 [Monday PM, A-4502 building A]: Chair: L. Stafford		
O2-4	Michel Moisan	Reproducible plasma columns sustained by EM field with a linearly decreasing axial electron density that depends solely on the gas pressure, field frequency and tube radius
O2-5	Philipp Wirth, Máté Vass, Thomas Mussenbrock	Global Chemistry Modeling of Biogas Conversion in Surface Dielectric Barrier Discharges with Vortex-Induced Mixing
O2-6	Valentina Riazantceva, Lyes Sebih, Ahmad Hamdan, Emile Carbone, Zhangen Chen, Shuhui Sun	Relative Humidity Role in Discharge Mode Probability for Nanosecond Plasmas with a Confined Water Droplet
O2-7	Dante Filice, Sylvain Coulombe	Pulsed RF Excitation in CO_2-CH_4 Mixtures: Electrical Characteristics of Power Modulation
O2-8	Sander Nijdam, Wouter Meekes	Streamer diagnostics using a flexible fast pulse source
Session 5 [Tuesday AM, A-4502 building A]: Chair: A. Bourdon		
Invited-I3	Katharina Stapelmann, Jonathan E. Thomas, Kristina Pattison, Suneel Kumar, Francois Berthiaume, and Vandana Miller	Plasma endpoint detection for wound healing
O3-1	Joanna Pawlat, Agnieszka Mazur – Lesz, Elżbieta Grządka, Piotr Terebun, Dawid Zarzeczny, Michał Kwiatkowski, Agnieszka Starek – Wójcicka, Irena Malinowska, Magdalena Mnichowska-Polanowska, Monika Machoy	The influence of cold plasma on dental prosthetic materials
O3-2	Adrien Gady, Gérard Bauville, Joël Lemaire, Pascal Jeanney, Michel Heninger, João Santos Sousa, Stéphane Pasquiers, Antoine Pallandre	Synthesis of early life's buildings blocks using non thermal plasmas in microfluidic structures
O3-3	Tomoyuki Murakami and Ippei Saito	Numerical Modeling of Physiochemical Reactions Induced by Plasma Stimulation

Session 6 [Tuesday AM, A-4502 building A]: Chair: M. J. Kushner		
O3-4	Juliette Letellier-Bao, Roxanne Thomas, Lisa Hermans, Derek Rosenzweig, Thomas Gervais, Daria Boffito, Sylvain Coulombe, Annemie Bogaerts, Stephan Reuter	Combining microfluidics with cold physical plasma as a new theragnostic platform for personalized cancer redox therapy
O3-5	Emily M. Hong, Zhenyu Ma, Justin French, Herek L. Clack	Non-thermal Plasma Inactivation of Airborne DNA Virus at Different AC Frequencies
O3-6	Sara Benmoussa, Guillaume de Lafontaine, Jacopo Profili	Effects of Non-thermal Plasma Treatment on Seed Germination Physiology in Native Plant species of Eastern Quebec
O3-7	H. D. Stryczewska, K. Ebihara, O. Boiko, G. Komarzyniec, S. Aoqui, F. Mitsugi	Applications of Plasma in Agriculture: Results of Polish-Japanese cooperation
Session 7 [Tuesday PM, A-4502 building A]: Chair: H. Stryczewska		
Invited-I4	Stephan Reuter	Control and diagnostic-based tailoring of plasma reactivity in health, environment, and agriculture
O4-1	Ahmed I. Haroun, Jordan Figueiredo, Bassam Dally, Deanna A. Lacoste	Characterization of H_2O_2 Production in an Undiluted O_2-H_2O DBD Reactor
O4-2	Stephane Simon, Laura Cacot, David Brassard, Jason R. Tavares, Frédéric Sirois, Stephan Reuter	Electrical control of plasma chemistry: Tuning reactive species production in atmospheric DBDs
O4-3	Pierre-Luc Girard-Lauriault, Avishek Banerjee, Saif Marji, Owen Armstrong, Gabriela Baez-Zaldivar	Formation of Higher-Order Products from Liquid Organic Feedstocks in a Micro-Second-Pulsed Gas-over-Liquid Dielectric Barrier Discharge
O4-4	Laura Cacot, Stéphane Simon, Alexandre Lapointe, David Brassard, Emilie Bédard, Jason R. Tavares, Stephan Reuter	Plasma-liquid interactions for hydroponics farms: a multi-phase diagnostic framework for reactor scale-up
Session 8 [Wednesday AM, A-4502 building A]: Chair: E. Carbone		
Invited-I5	François Reniers	New perspectives of dielectric barrier discharges for the deposition of thin films
O5-1	Léo Prévost-Notelet, Kevin Delcourt, Robin De Meyer, Houari Sahraoui, Luc Stafford	Accelerating the development of thin film deposition using an atmospheric pressure plasma torch through advanced optical diagnostics and digital twins

O5-2	Sarah Hekking, Robin De Meyer, Charles Moderie, Antoine Goullet, Agnes Granier, Clément Maheu, Mireille Richard-Plouet, Luc Stafford	Plasma-surface effects in dielectric barrier discharges: investigating diffuse, filamentary and hybrid discharge modes for material processing
O5-3	Alessandro Patelli, Riccardo Fiorotto, Ehsan Shakerinasab, Alessandro Andreetto	Impact on surfaces of dual frequency pulsed+RF plasma jet in open air
Session 9 [Wednesday AM, A-4502 building A]: Chair: F. Tochikubo		
O5-4	Oleksandr Boiko, Grzegorz Komarzyniec, Michał Aftyka, Marta Dziuba-Kozieł, Grzegorz Kozieł, Michał S. Gęca, Fumiaki Mitsugi, Henryka D. Stryczewska	The influence of key operating parameters of the three-electrode gliding arc reactor on the NO_x production efficiency
O5-5	Yiwei Jiang, Theo van de Ven, Jacopo Profili	Plasma-Enhanced Siloxane Coating of Carboxymethylated Cellulose Films for Improved Hydrophobicity and Moisture Barrier Performance
O5-6	Laura Cacot, Arghavan Yazdanpanah, Robin De Meyer, Heliam Klein, Mariam El Rachidi, Myrtil L. Kahn, Richard Clergereaux, Nicolas Naudé, Luc Stafford	Aerosol-Assisted Thin Film Deposition in a Dielectric Barrier Discharge: Effect of the Precursor on the Deposition Mechanisms
O5-7	Jordan Figueiredo, Bassam Dally, Deanna Lacoste	In-flight reduction of iron oxides from various sources by hydrogen plasma
Session 10 [Wednesday PM, A-4502 building A]: Chair: J. Profili		
O6-1	F. Massines, A. Perdrau, A. Najah, B. Plujat, H. Glenat, S. Eichendorff, Y. Gorand, E. Bèche, N.Barros	An innovative process to synthesize gold/polymer nanocomposite thin films in a dielectric barrier discharge
O6-2	Richard Krumpolec, Monika Stupavská, Tereza Rybová, František Zelenák, Mirko Černák	Surface Activation and Nitrogen-Based Functionalisation of Porous Materials by a Novel Linear Atmospheric-Pressure DCSBD Plasma Jet
O6-3	Yusuke Nakagawa, Yusei Takano, Fumiyoshi Tochikubo	Anisotropic Hydrophilization of Resins Using Atomic Oxygen Produced by Laser Photolysis of O_3
O6-4	Jeremy Pothier, James McGettrick, Gaétan Laroche and Jacopo Profili	Enhancing the Durability of PECVD Antifog Coatings for Mining Inspections

O6-5	Lyes Sebih, Emile Carbone, Ahmad Hamdan	Mechanisms of anisotropic silver growth in pulsed plasma–liquid discharges: Interfacial confinement and oxidative etching
Session 11 [Wednesday PM, A-4502 building A]: Chair: K. Stapelmann		
O6-6	B. Sadeghi, L. Kuijpers, V.M. Fischer, C.F.A.M. van Deursen, W.E.N. van Harskamp, C.F. Lopez-Camara, W.A. Bongers, P.C. Thüne, M.C.M. van de Sanden	Microwave Plasma Methane Pyrolysis: carbon collection and quality analysis
O6-7	Xingyu Chen, Jiaqi Tang, Mauritius C.M. van de Sanden	Quantifying Atomic Oxygen Flux in an Atmospheric-Pressure Microwave Induced Plasma Decapsulation System
O6-8	Ronny Brandenburg, Jafet Ortiz Valverde, Hamed Mahdikia, Rüdiger Hink, Jan Hummel, Dirk Uhrlandt	On the Characterization of Gliding Arc Discharges in Carbon Dioxide Containing Gases at Atmospheric Pressure
O6-9	Hermina Beica	Etalon Spectrometry: Principles and Applications for High-Resolution Plasma Diagnostics
Session 12 [Thursday AM, A-4502 building A]: Chair: S. Coulombe		
Invited-I6	Tom Huiskamp, Chiel Ton, Mohsen Mortazavi, Bas Dekker, Guus Pemen	The scalability of streamer discharge generation for industrial air purification
O7-1	Clay Davis, Thomas Holsen, Selma Mededovic Thagard	The role of bubble hydrodynamics in plasma-based PFAS treatment
O7-2	Prisca Stephanie Kandjo Ngoubeyou, Dunpin Hong, Hervé Rabat, Benoit Cagnon, Béatrice Vallee, Olivier Aubry	Non-thermal plasma-Fe functionalized activated carbon coupling for PFOA removal in water
O7-3	Jisu Jeon, Tiago C. Dias, Stephen Olson, Xuefei Qiu, Selma Mededovic Thagard, Mark J. Kushner	PFOA Plasma Degradation in Water: Long-Time-Scale Modeling Investigation
Session 13 [Thursday AM, A-4502 building A]: Chair: N. Gherardi		
O7-4	Koichi Sasaki, Tsukasa Yamakawa, Yoshinobu Inagaki	Synthesis of ammonia using atmospheric-pressure nitrogen and water vapor plasmas

O7-5	Marc Böke, Henrik van Impel, Yue Cheng, David Steuer, Volker Schulz-von der Gathen, Judith Golda	Characteristics of a Micro-cavity Plasma Array for Gas Conversion
O7-6	Catherine Batiot-Dupeyrat, Samy Bouacem, Thomas Orrière, Deborah De Masi, Paul Hazemann	Plasma and Plasma-catalysis coupling for hydrogen production from H_2S decomposition
O7-7	Carlo van Melis, Tom Huiskamp, Wilfred Hoeben	Plasma-driven upgrading of hydrocarbons with CO_2
O7-8	A. Hecimovic, R. Antunes, C. Kranig, A. Meindl, U. Fantz	Reverse water gas shift in microwave plasma for O_2 removal and CO_2 conversion enhancement

CONTRIBUTED POSTERS (Atrium - Building B)

Poster	Authors	Title
P01	Sander Nijdam, Jianan Wang, Jordin Janssen, Lucia Svandova, Ayush Kumar	Update on “Bottled Lightning” project
P02	Koichi Sasaki, Raio Torihama, Yoshinobu Inagaki	Anomalous lifetime of hydrogen TALIF in a stainless-steel chamber equipped with atmospheric-pressure hydrogen-argon mixture plasma: possible contribution of impurities
P03	Miloud Mohamed Mahdi Boussa, Lyes Sebih, Ahmad Hamdan	Experimental and numerical investigation of nanosecond discharges in air gap with hemispherical dielectric layer
P04	Julien Lauzé	Space and Phase Resolved Optical Emission Spectroscopy of Pulse-RF Plasma
P05	Francisco Javier Morales Calero, Antoine Durocher-Jean, Fatima Khazem, Luc Stafford.	Hyperspectral Imaging for 2D spectroscopic characterization of atmospheric pressure Ar–CO_2 plasmas
P06	Alex Bessin, Antoine Belinger, Simon DAP, Nicolas Naudé, Nicolas Gherardi	A dual-zone discharge cell for probing memory effects in atmospheric pressure diffuse DBDs
P07	Léo Prévost-Nottelet, Kevin Delcourt, Antoine Durocher-Jean, Robin De Meyer, Houari Sahraoui, Luc Stafford	Optical and hyperspectral characterization of the plume of an atmospheric plasma torch for organosilicon thin film deposition
P08	X. Mallet, A. Belinger, N. Gherardi, N. Naudé, S. Dap	Influence of gas residence time on breakdown characteristics in CO_2 Atmospheric Pressure Townsend Discharges
P09	Jean-Philippe Comtois, J. Santos Sousa, F. Sirois, I. Korolov, T. Bolles, D. Seletskiy, T. Mussenbrock, S. Reuter	Molecular excitation in plasma jets powered by ns-pulse sustain
P10	Théo Sillaire, Amina Hussein, Ahmad Hamdan	Nanosecond discharge in heptane-water emulsion: influence of droplet distribution on the discharge characteristics
P11	Yujiro Kanda, Kei Takahashi, Soushi Hirota, Naoki Osawa	Investigation of Charged Particle Desorption Characteristics from Barrier Surfaces: Capable and Incapable of Generating APTD in Air
P12	Naoki Higashi	A multi-fluid Euler–Poisson scheme with discrete conservation of total energy

Posters

P13	Shinobu Ono, Yujiro Kanda, Naoki Osawa	Investigation of Temporal Evolution in Surface Potential during Atmospheric Pressure Townsend Discharge in Air: Effects of Applied Voltage Waveform
P14	Julien Trahan, Jean-Baptiste Billeau, Alexandre Lapointe,Jean-Philippe Comtois, Stephan Reuter	Modeling and Characterization of Low Flow Plasma Actuators
P15	Christina Strilets, Abdulhakeem O. Yusuf, Nicholas F. Beier, Audren Dorval, Ahmad Hamdan, Richard Sydora, Amina Hussein	Laser-Driven X-rays for Imaging Pulsed Discharges in Liquids
P16	Nicholas Stine, Jitlekha Tubsuri, Christopher M. Sales, Alexander Fridman	Minimization of Hazardous By-products During the Destruction of Hydrofluoro-carbon Contaminated Oils via Liquid Injection Incineration Catalyzed by Non-thermal Gliding Arc
P17	Alessandro Patelli, Mattia Negrisolo, Alberto Miotto, Giulia Tomei, Riccardo Fiorotto, Ehsan Sha-kerinasab, S.M.Wahaj Ejaz, Enzo Menna, Ester Marotta	Low temperature degradative desorption of perfluorooctanoic acid (PFOA) from granular activated carbon (GAC) induced by atmospheric plasma
P18	Patryk Ludera, Maxence Lévesque, Michel Ouellet, Jacopo Profili	Degradation of Methylene Blue in Water Using Cold Atmospheric Plasma
P20	Elène Bizeray, Antoine Belinger, Simon Dap , Nicolas Gherardi, Luc Stafford , Fiorenza Fanelli, Nicolas Naudé	An aerosol-assisted dielectric barrier discharge process for nanocomposite thin film deposition in N_2
P21	Kevin Delcourt, Léo Prévost-Notelet, Robin De Meyer, Houari Sahraoui, Luc Stafford	Towards a data-driven Digital Twin for plasma-enhanced thin film deposition: combining neural networks, hybrid modeling and AI-assisted experimentation
P22	Zoé Michon, Léo Prévost-Nottelet, Alexis Paillet, Myrtil L. Kahn, Richard Clergereaux, Luc Stafford	Impact of temperature in surface treatment of ZnO nanoparticles by a low power blown arc plasma jet
P23	Isaac Triplett, Pierre-Luc Girard-Lauriault, Ahmad Hamdan	Investigation of the Products Resulting from the Application of a Streamer Discharge to a Liquid-Liquid Interface Containing Metal Salts with a Wide Range of Reduction Potentials
P24	C. Moderie, N. Naudé, R. Martel, L. Stafford	Defect Formation in Graphene via Localized and Global Energy Deposition in Filamentary and Diffuse Dielectric Barrier Discharges
P25	Marie Brabant, Jehan Waeytens, François Reniers	Modulation of Localized PMMA Coatings by Carrier Gas in AP-PACVD

P26	Elio Eid, Ahmad Hamdan	Influence of plasma treatment conditions on the production of reactive species in water and on the modification of its surface tension
P27	Juliette Zveny, Antoine Remy, Amélie Bourgeois, Teo Serra, Anne Botteaux, Jacques Devière, Arnaud Lemmers, Alain Dechambre, Antoine Nonclercq and François Reniers	Impact of water-filled biofilm in plasma decontamination of endoscopes
P28	Gebremedhin Gebremariam Gebremical, Junior Bernardo Molina Hernandez, Silvia Tappi, Luigi Ragni, Clemencia Chaves Lopez, Massimiliano Rinaldi and Pietro Rocculi	Effects of Cold Atmospheric Plasma on Microbial Inactivation, and Quality Changes of Mechanically Fluidized Maize Flour