International Low Temperature Plasma Community

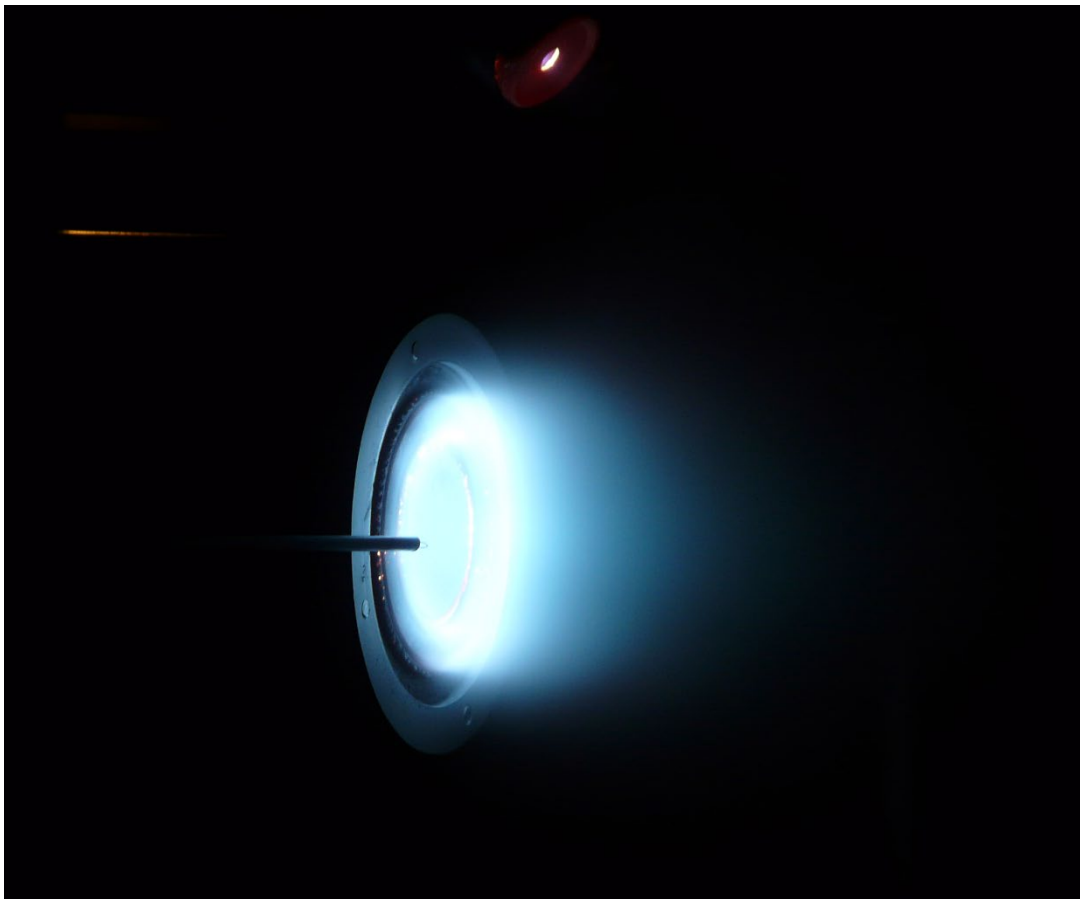
https://mipse.umich.edu/iltpc.php, iltpc-central@umich.edu

Newsletter 24

29 June 2022

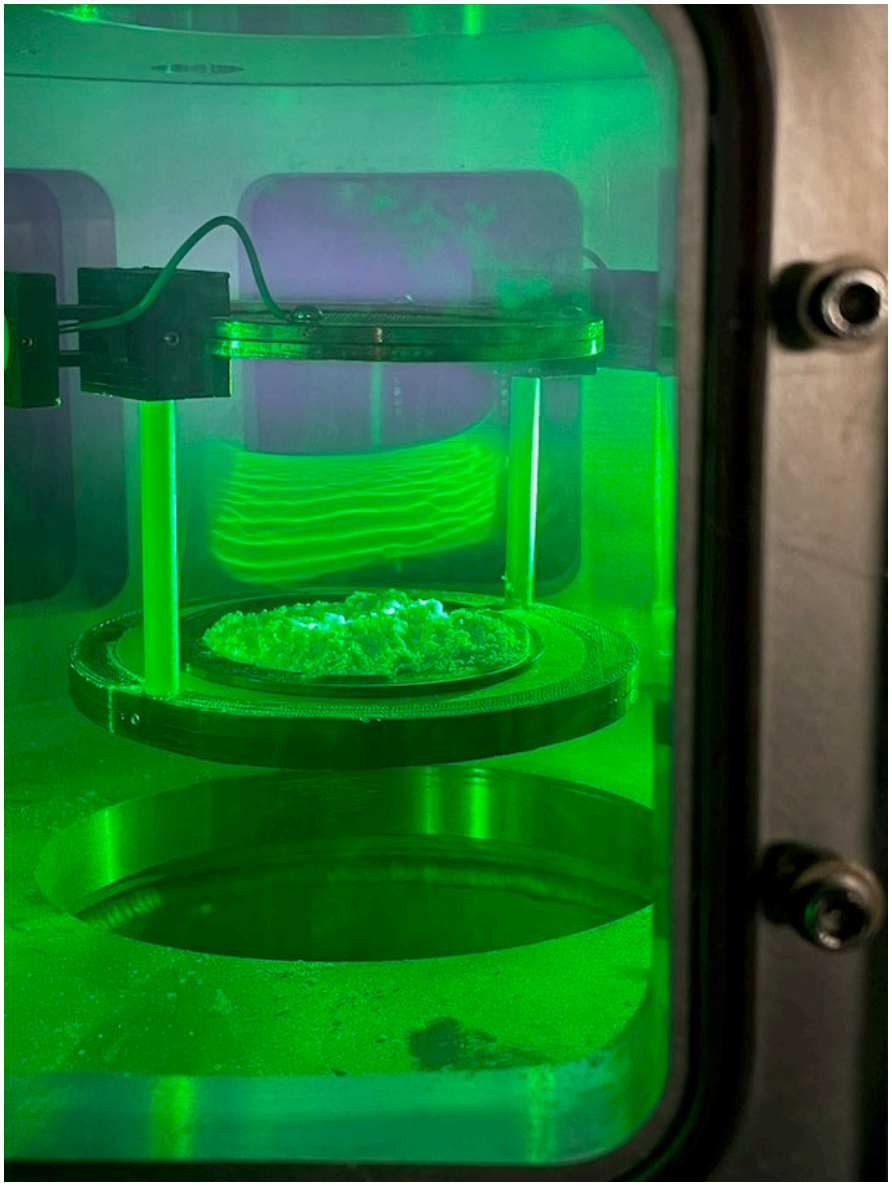
Images to Excite and Inspire!

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



A wall-less Hall thruster: The image shows a 3 cm diameter 200 W wall-less Hall thruster (HT) operating with xenon as the propellant. A plasma hollow cathode-neutralizer (at the top) and the emissive probe for measuring plasma potential are also seen in this image. In wall-less HTs, the magnetic field is similar to a sputtering magnetron. However, the thruster anode is placed on the thruster body, while the cathode is down-stream of the plasma flow. In such an inverse magnetron configuration, the ionization of the propellant and ion acceleration occur outside the thruster. This reduces interactions between the plasma and the thruster parts compared to conventional HTs and promises a longer thruster lifetime. With a simpler design, these wall-less HTs are easier to miniaturize for operation at low power levels. Results of these measurements on this HT suggest that the thrust is generated by ion acceleration by the J × B force in the region of the fringing magnetic field and by plasma expansion in the diverging magnetic field near the thruster axis. The former mechanism is the same as in conventional HTs, while the latter mechanism is the same as in a magnetic nozzle. The wall-less HT should be capable of achieving a higher thrust density than conventional devices.

Dr. Jacob Simmonds (jsimmond@pppl.gov) and **Dr. Yevgeny Raitses** (yraitses@pppl.gov), Princeton Plasma Physics Laboratory, Princeton, NJ, USA.



Photograph of dust density waves in an argon plasma in the Magnetized Dusty Plasma Experiment (MDPX) device. The plasma is generated using a 13.56 MHz rf source that is connected to a rotatable electrode – whose axis is connected to the 3D printed black block at the center of the image. The goal of this collaborative study by Wittenberg University is to study the evolution of dust acoustic / dust density waves in the presence of a strongly magnetized plasma. The rotating electrode allows the experiment to introduce an angle between the direction of gravity and the direction of the background magnetic field, which is an important feature for studying dusty plasmas under the influence of magnetic fields. Experiments are performed as part of a collaborative user project in the Magnetized Plasma Research Laboratory (MPRL) at Auburn University.

Photo courtesy of **Prof. Jeremiah Williams**, Wittenberg University, USA (jwilliams@wittenberg.edu); **Dr. Saikat Chakraborty Thakur** (szc0199@auburn.edu) and **Prof. Edward Thomas, Jr.** (etjr@auburn.edu), Auburn University, USA.

In this issue:

Call for Contributions

Please submit content for the next issue of the Newsletter. Please send your contributions to iltpc-central@umich.edu by **August 12, 2022.** Please send contributions as MS-Word files if possible – and **avoid sending contributions as PDF files**.

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

LTP Perspectives: Policy, Opportunities, Challenges

Why Do We Need Computational Modeling in the Low-Temperature Plasma Community?

Do we need to invest in the development of computational models in the low-temperature plasma (LTP) community? Many engineering devices are already used in the business sector and there are already many simulation tools available. Some examples include etching and deposition processes, surface activation, atmospheric pressure plasma jets, high power microwaves, and spacecraft electric propulsion.

There are a variety of reasons why computational modeling can be helpful. One is to reduce the cost of experiments needed when designing an engineering system. Second, computational models track various states and parameters in space and time, while measurements may be limited to a few points and may have difficulties capturing the multiscale phenomena. Third, computational models together with experimental data are useful to decipher the nonlinear dynamics of complex phenomena.

As a case study, let us briefly look at the history of the aeronautical community. In 1903, the Wright Brothers successfully flew a motor-operated airplane. Commercial aviation started in the 1920s and the first commercial jet airliner was introduced in the 1950s. In the 1970s and early 1980s, foundational work of computational fluid dynamics (CFD) was established. In the 1990s, the first commercial aircraft was designed using computer simulations. It took more than half a century for predictive computer simulations to become useful for designing aircrafts since the dawn of commercial aviation.

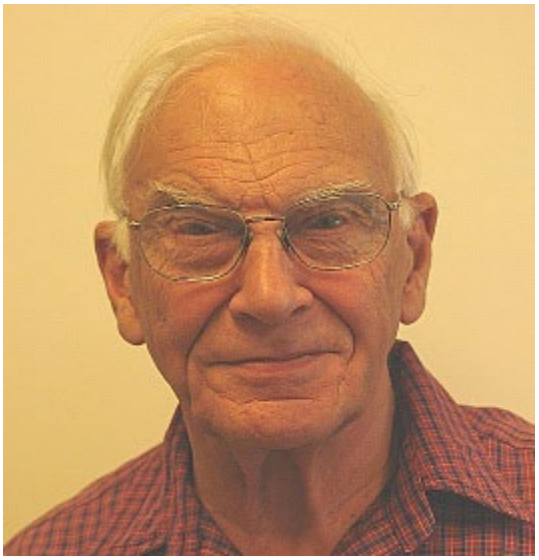
What did the aeronautical community do? Since the dawn of CFD in the 1970s-1980s, national laboratories hired researchers from all around the world without any restrictions (e.g., nationality), many academic institutions have hired faculty members who specialize in CFD, and CFD became a fundamental topic in undergraduate and graduate programs particularly in aerospace and mechanical engineering departments. The CFD community has developed both low- and high-fidelity models that enable understanding of the detailed physical processes, 3D simulations of full device-scale phenomena, and optimization of airplane design.

CFD research and development has helped the growth of the aeronautical industry and other communities that employ fluid dynamics. What is most important is perhaps that next-generation researchers are attracted from and produced in different disciplines, contributing to the continual growth of the CFD community.

Where are we now in the LTP community? LTP is a fascinating field of study as it involves coupling of various disciplines, requiring a multidisciplinary approach to research. Such complexity would likely require even more variations of numerical algorithms, schemes, and solvers to construct robust predictive models for better understanding of LTP systems. Increasing participation from diverse background is necessary not only to help the growth of the LTP community but also to impact other scientific communities.

Prof. Ken Hara
Stanford University, USA
kenhara@stanford.edu

Professor Robert (Bob) Woodhouse Crompton – From Swarms of Charged Particles to Scattering Cross Section Sets



Bob Crompton's name is uniquely identified with the physics of swarms of charged particles, indeed it was he who actually coined the phrase *swarms*. Robert (Bob) Crompton was born in Adelaide in 1926. He completed his undergraduate and graduate studies at the University of Adelaide, his thesis supervisor being Sir Leonard Huxley, a student of Sir John Townsend.

Over his career Bob developed (often in collaboration with Malcolm Elford and chief technical officer John Gascoigne) the most accurate experimental devices for measurements of drift velocities and characteristic energies (D_T/μ), as well as for direct determination of thermal diffusion coefficients and attachment rates. Data were used as the basis for determination of electron scattering cross sections. As example of the great care invested, measurements of the gas pressure were made using a Texas Instruments quartz spiral gauge, not available today, but with a linearity and dynamic range unmatched by other devices. These gauges were calibrated using a primary pressure standard that was available in the laboratory.

In addition, under Bob's guidance, some of the first computational transport codes were developed by his students and postdocs, a two-term code with super-elastic collisions and a Monte Carlo code designed primarily to test the accuracy of the two-term theory. The same care for detail and accuracy was invested into all of the aspects of experimental devices, measurements and interpretation of the data.

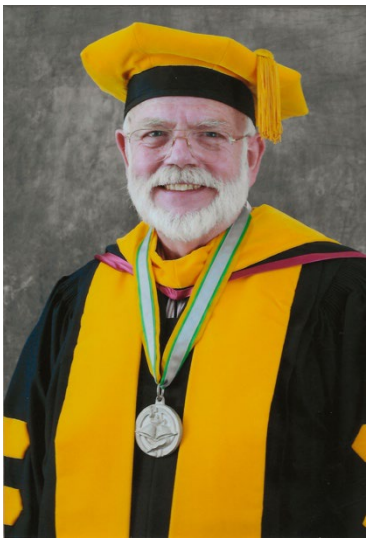
Bob's crowning achievements include the first highly accurate cross section for elastic scattering of electrons from He below the threshold for excitation. His values remain the most accurately determined cross section available even 50 years after its publication. In a similar vein, and with an equal accuracy, data for argon and hydrogen were provided as test cases, as well as the data for nitrogen and other molecular gases. Last but not the least, attachment rates measured for room temperature electrons in SF_6 have been regarded as the most accurate and widely used to normalize the results of relative measurements. All of this was done with a keen understanding of both the binary collision experiments and theory, as well as the physics and practical implications of low temperature plasmas. One may claim easily that most of the cross section sets available today for the basic benchmark gases are based in part on the data developed by Bob and his group.

Bob Crompton is an amazingly friendly person. Not just his own students but all the students in the department regarded him as their scientific 'father' and his care extended way beyond merely the scientific issues. He was a great practical joker and also really happy when he was at the receiving end of same. He used to invent the names of tools when he realized that his student may not know which tool to choose. 'Pass me the spiffler' he would say. And he would always point out: "anything that is worth doing is worth doing to the best of your ability". There were no half-efforts for Bob, nothing less than 100% would suffice.

Prof. Zoran Lj. Petrović, Institute of Physics, Belgrade, Serbia, zoran@ipb.ac.rs
Prof. Stephen J. Buckman, Australian National University, Australia, Stephen.Buckman@anu.edu.au

Footnote: Just hours after finalizing this text, we received the sad news that Bob Crompton, our dear mentor and friend, has passed away on June the 22nd, only a few weeks after his 96th birthday. He was one of the true founding fathers of the LTP physics community. It is a great loss to us all, especially his co-workers. Above all, we send our condolences to his family.

Tribute to Prof. Don Madison



With deep sadness, we inform the scientific community that Don Madison, Curator's Professor at the Missouri University of Science and Technology, passed away on May 14, 2022.

Don Harvey Madison was born in Pierre, South Dakota, on January 4, 1945. He married Lina Engel in 1966. The couple has two children, Lisa and Kristina, as well as six grandchildren. After graduating *summa cum laude* with a B.S. degree in mathematics from Sioux Falls College in 1967, Don was advised to study physics instead of mathematics and obtained his M.S. degree in 1970 and his Ph.D. degree in 1972, both from Florida State University under the supervision of W.N. Shelton. His Ph.D. thesis, entitled *The Distorted-Wave Theory and Its Application to the Excitation of the* ^1P *States of Helium and Mercury*, was the start of a highly successful career in the development of the distorted-wave approach for electron collisions with atoms and later molecules. After a two-year stay as a post-doctoral researcher with Eugen Merzbacher at the University of North Carolina, Don was appointed Assistant Professor of Physics at Drake University in Des Moines, Iowa, in 1974. He was named the Levitt Distinguished Professor of Physics in 1984. Don was highly respected at Drake, where he received several awards for both his outstanding research and teaching, including the "Centennial Scholar Award" in 1981 and the "Liberal Arts Teacher of the Year in the Sciences Award" in 1983.

Don was a highly sought-after collaborator, especially by experimental colleagues who liked to compare their measurements with his theoretical results. They often asked for guidance regarding future investigations by using his predictions of where the most interesting physics might be found in the vast parameter space of targets, collision energies, and angular ranges. During one of his frequent visits to other institutions, he met Klaus Bartschat at the University of Münster in Germany. They immediately became good friends and life-long collaborators. Don left Drake after a sabbatical tour "around the world" to join the University of Missouri at Rolla in 1988. The position he vacated at Drake went to Klaus.

After moving to Rolla, Don immediately started to establish new collaborations, in particular with Tim Gay and later Michael Schulz. With Tim he continued his work on electron-atom scattering, while he (re)started his studies of ion-atom collisions with Michael. Don also realized early on the importance of expanding his work from atomic to molecular targets, and thus generalized his codes to handle these more complicated scattering problems. He also expanded his efforts from excitation to the much more challenging ionization processes. Together with many students, who greatly benefitted from his guidance and nearly infinite patience, Don developed sophisticated formulations and computer codes to extend the distorted-wave framework of atomic collisions for which he was widely recognized as the world's expert. Not surprisingly, Don also received many honors at Rolla, including multiple "Faculty Excellence" and "Outstanding Professor" awards. In 1998, he was named Curator's Professor of Physics.

Don was awarded Fellowship in the American Physical Society in 1992 for "*pioneering work in the calculation of cross sections, spin polarizations, and angular correlation parameters for atomic excitation and ionization by simple charges particles*." He published 287 papers in highly-regarded peer-reviewed journals, gave 130 invited talks, made countless other contributions to international conferences, and was a sought-after speaker at colloquia and seminars at institutions around the world. In 2018, he was honored as the Convocation Speaker at Sir Padampat Singhania University in India.

In addition to being an excellent physicist, Don also served the scientific community with great distinction. For many years, he was the Director of the Laboratory for Atomic, Molecular and Optical Research (LAMOR) at Rolla. He organized the 2001 ICPEAC satellite meeting on "Polarization and Correlation" in Rolla. From 1994–1998, Don was chair of TAMOC (Theoretical Atomic, Molecular, and Optical Community, a subgroup of

the Division of Atomic and Molecular Physics (DAMOP) of the American Physical Society). He served as treasurer of the Gaseous Electronic Conference from 2002–2006 and helped organizing many other conferences. Don was also a tireless advocate for physics education at all levels. He was instrumental in establishing a special session on "Outstanding Undergraduate Research in Atomic, Molecular, and Optical Physics" in 1994, a competition that is still being held at the annual DAMOP meetings.

Most importantly, Don was a humble man, who made the world a better place. He served on and chaired the Board of Directors of the Russell House for battered women and raised thousands of dollars for them. Don also served as Chairman of the Board of Directors for LOVE, a local organization to help people in need. He was active in the Episcopal Church, serving on the Vestry and also as its treasurer for many years.

Don will be sadly missed by his family and his many friends and colleagues.

Prof. Klaus Bartschat, Drake University, Des Moines, USA, klaus.bartschat@drake.edu
Prof. Timothy J. Gay, University of Nebraska, Lincoln, USA, tgay@unl.edu

General Interest Announcements

- **Research Experiences for Undergraduates – US National Science Foundation**

The US National Science Foundation (NSF), strongly supports the involvement of undergraduate students in research as part of individual grants to principle investigators, as supplements to grants and as Research Experiences for Undergraduates (REU) sites. The REU sites support groups of undergraduate students in a single or multi-disciplinary topics. Although NSF grants are typically reserved for researchers at US institutions, REU projects and sites are encouraged to have international components and collaborations. US and non-US researchers are encouraged to discuss this opportunity to include undergraduates in research.

The REU Site program is described in the solicitation NSF 22-601
https://www.nsf.gov/pubs/2022/nsf22601/nsf22601.htm
with the proposal submission **deadline of September 6th, 2022**.

As part of the REU Site opportunity, please note three special opportunities all of which may be of interest to the LTP community (see the solicitation for details):

1) *Partnership with the Semiconductor Research Corporation (SRC)*: https://beta.nsf.gov/funding/opportunities/research-experiences-undergraduates-reu/announcements/new-partnership
2) *Partnership with the Department of Defense:* NSF engages in a partnership with the Department of Defense (DoD) to expand undergraduate research opportunities in DoD-relevant research areas through the REU Sites program.
3) *International Projects:* The REU program encourages projects with an international dimension... International projects typically involve partnering a U.S. REU project with one or more international collaborators in a specific institution or organization. Successful international REU projects include (1) true intellectual collaboration with a foreign partner and (2) benefits that are realized from the expertise, specialized skills, facilities, phenomena, or other resources that the foreign collaborator or research environment provides.

For more information on LTP focused REU opportunities, contact:

Dr. Vyacheslav (Slava) Lukin
National Science Foundation, USA
vlukin@nsf.gov

- **Future of Semiconductors - Teaming for Co-Design Research Capacity (FuSe) – US National Science Foundation**

  The US National Science Foundation (NSF) has a new opportunity for research grants supporting co-design for advancing the science, technology and manufacture of semiconductor devices – the Future of Semiconductors- Teaming for Co-Design Research Capacity (FuSe). Co-design has been widely recognized in government and industry studies as means to accelerate advances in semiconductor technology. This is particularly true for semiconductor manufacturing that involves many plasma aided steps. Information on this funding opportunity is at:

  https://beta.nsf.gov/funding/opportunities/future-semiconductors-teaming-co-design-research-capacity-fuse

  For more information on LTP opportunities in the FuSe program, contact:

  Dr. Jose Lopez
  National Science Foundation, USA
  joslopez@nsf.gov

Meetings and Online Seminars

- **Online Seminars – OLTP and IOPS**

  The *Online Low Temperature Plasma* (OLTP) seminar series and the *International Online Plasma Seminar* (IOPS) are continuing to provide the international community with regular opportunities to hear from leading researchers in the field.

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

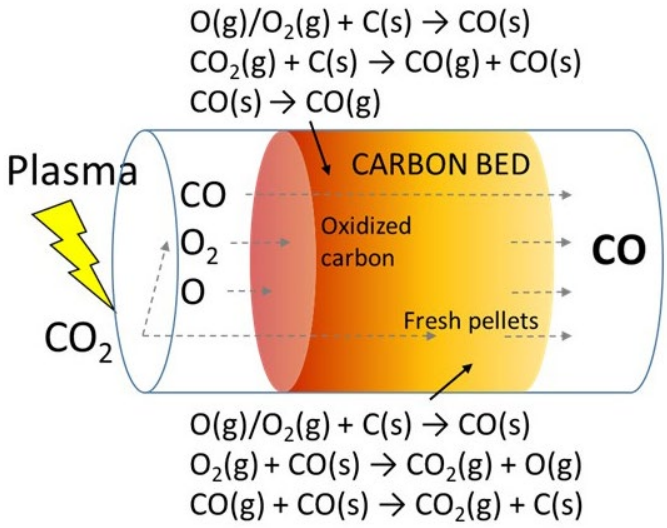
    Dr. Anne Bourdon and **Dr. Igor Kaganovich**, OLTP Co-Chairs
    anne.bourdon@lpp.polytechnique.fr, ikaganov@pppl.gov

  - The program of the IOPS (and links to past seminars) can be found at:
    http://www.apsgec.org/main/iops.php
    Dr. Kallol Bera, IOPS Chair, kallol_bera@amat.com

Community Initiatives and Special Issues

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

Carbon Bed Post-Plasma to Enhance the CO_2 Conversion and Remove O_2 from the Product Stream



Schematic of the mechanism of carbon gasification in the post CO_2 plasma region, leading to enrichment of CO in the product mixture.

In this paper, we present results from an investigation of a carbon (charcoal) bed placed after a Gliding Arc Plasmatron (GAP) reactor, to enhance the CO_2 conversion, promote O/O_2 removal and increase the CO fraction in the exhaust mixture.

Using this carbon bed, the CO_2 conversion is enhanced by almost a factor of two (from 7.6 to 12.6%), while the CO concentration increases by a factor of three (from 7.2 to 21.9%), and O_2 is essentially completely removed from the exhaust mixture. Consequently, the energy efficiency is greatly improved (up to 45.4%) and the energy cost significantly drops (to 25.4 kJ-L^{-1}). However, time-resolved measurements of the temperature and of CO_2, CO and O_2 reveal that initial enhancements are not maintained in our current setup. Therefore, we also present a model to study the gasification of carbon with different feed gases (i.e., O_2, CO and CO_2 separately), from which we can conclude that the drop in CO_2 conversion and in CO concentration after a few minutes is attributed to deactivation of the carbon bed, due to rapid formation of oxygen complexes at the surface.

By combining experimental data with modelling insights, this work sheds light on complex mechanisms occurring at the carbon surface during its gasification post-plasma.

Contacts:
Dr. Fanny Girard-Sahun, fanny.girard-sahun@uantwerpen.be
Omar Biondo, omar.biondo@uantwerpen.be
Prof. Annemie Bogaerts, annemie.bogaerts@uantwerpen.be
University of Antwerp, Belgium

Source:
Chemical Engineering Journal **442**, 136268 (2022). http://doi.org/10.1016/j.cej.2022.136268

New Resources

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

Career Opportunities

- **Post-doctoral Research Fellow, Computational Plasma-liquid Modelling, James Cook University, Australia**

  A post-doctoral research fellow position is available in the modelling of plasma interactions with liquids within the research group of **Prof. Ron White** at James Cook University, Townsville, Australia. The position involves the development and application of models for low temperature plasmas and their interaction with liquids, including electron and charged particle induced processes and transport at the plasma/gas-liquid interface. This is a project that is funded by the Australian Research Council under their Discovery Project scheme.

  The post-doctoral research fellow should have the following skill-sets:

  - Expertise in modelling of electron/ion transport in gases and/or liquids (e.g. Boltzmann equation or Monte Carlo simulations) under non-equilibrium conditions.
  - Expertise in the fundamental processes of low temperature plasmas.
  - High performance computing skills.
  - High level oral and written communication skills.

  The initial position is for 2-3 years with extension subject to performance and availability of funds. The position is available immediately in Townsville QLD Australia.

  Applicants should send a cover letter addressing above criteria (including date applicant is available) and CV, as well as 3 references to Prof. White. Any enquires can also be made to this email address.

  Contact:
  Prof. Ron White
  James Cook University, Australia
  ronald.white@jcu.edu.au

- **Post-doctoral Research Opportunity in Applied Discharge Plasma Science, Stanford University, USA**

  We have an immediate opportunity for a researcher to study the development of air/atmospheric pressure plasmas for applications to problems in sustainability. We are examining the use of a range of plasma technologies for problems ranging from nitrogen fixation, CO_2 splitting and even direct air-capture. Opportunities exist to work with new companies in the Silicon Valley as well as other research groups at Stanford, including researchers in the new School for Sustainability. Knowledge of plasma chemistry is desired, but not required. We want someone who is hands-on, comfortable in the laboratory and on working on plasma devices. The candidate should be enthusiastic about the prospects for transitioning technology from the lab to the field. Publications are valued but the emphasis here is on making impact on solving important problems related to climate science. Interested researchers should contact Prof. Cappelli.

  Contact:
  Prof. Mark Cappelli
  Stanford University, USA
  cap@stanford.edu

- **Post-doctoral Research Fellow, Computational Low Temperature Plasmas and High-Mach Number Flows, University of Illinois, USA**

  A post-doctoral research fellow position in computational low temperature plasmas and high-Mach number flows is available in the research group of **Prof. Deborah A. Levin** at the University of Illinois, Urbana-Champaign USA in the department of Aerospace Engineering. The postdoctoral fellow will typically work on two projects in the area of particle-in-cell (PIC) simulations, some coupled with direct simulation Monte Carlo (DSMC). Examples of applications include electric propulsion devices and facility effects, inclusion of plasma chemistry models for both plasma processing and high-Mach number reentry flows, two-phase flows including dusty plasmas, and high-Mach number plasma sheath-boundary layer interactions. The position requires knowledge of high performance, massively parallel computing and knowledge of GPUs is helpful. The post-doc will interact with research students and other members of the group as well as assist in proposal preparation.

  More information about recent publications may be found at: https://aerospace.illinois.edu/directory/profile/deblevin. The initial appointment period is 1 year with reappointment for 2 or 3 years subject to performance and availability of funds. Applicants should send a CV, indicating available start date, recent publications, and contact information for 3 references to Prof. Levin.

  Contact:
  Prof. Deborah Levin
  University of Illinois at Urbana-Champaign, USA
  deblevin@illinois.edu

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

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

  The PDRF should have expertise in the fundamental processes of LTPs, plasma chemistry and plasma surface interactions; expertise in developing and maintaining parallel computer models for LTPs using high level languages; and excellent oral and written communication skills.

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

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

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

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

- **Post-doctoral Research Position Vortex Dynamics in External Flows Using Magnetized Electron Plasmas, University of California at San Diego, USA**

  The University of California San Diego positron group (positrons.ucsd.edu) seeks a postdoctoral researcher to study fluid dynamics using trapped electron plasmas. In this system, electron density, which is the analog of vorticity, can be measured directly. The successful candidate will have an opportunity to do both experiments and complementary computer simulations. Phenomena of interest include vortices in shear and strain flows, vortex damping, splitting and destruction, and driven vortex turbulence. A PhD degree in experimental science or engineering is required. A background in plasma or fluid physics is preferred. Interested parties should send a CV, a summary of research interests, and a list of three references familiar with the applicant's academic and research experience to Prof. Surko.

  Contact:
  Prof. Clifford Surko
  University of California at San Diego, USA
  csurko@ucsd.edu

- **Post-doctoral Position, Plasma-Activated CO_2 Conversion, Yale Center for Natural Carbon Capture, Yale University, USA**

  A Postdoctoral Associate position in the areas of plasma and electrocatalytic CO_2 conversion is available as early as July 1, 2022 and will be funded by the Yale Center for Natural Carbon Capture (https://naturalcarboncapture.yale.edu/) for a period of two (2) years. The research will be conducted in the lab of **Prof. Lea Winter** in the Department of Chemical and Environmental Engineering in collaboration with the research group of **Prof. Hailiang Wang** in the Department of Chemistry. Candidates should be pursuing or hold a PhD in Chemical Engineering, Chemistry, Environmental Engineering, or a related field. Expertise in non-thermal plasma or electrochemistry is preferred.

  To apply, applicants should submit a CV including a list of publications, a 1-page statement detailing research experience and interests, and contact information of 1-2 references to Prof. Winter at lea.winter@yale.edu.

  About the Winter Lab in Chemical and Environmental Engineering at Yale: https://seas.yale.edu/faculty-research/faculty-directory/lea-r-winter

  About the Wang Lab in Chemistry at Yale: https://wanglab.yale.edu/

  Contact:
  Prof. Lea R. Winter
  Yale University, USA
  lea.winter@yale.edu

- **Post-doctoral Position, Use of Cold Plasma in Agriculture, University of California at Davis, USA**

  We are seeking postdoctoral candidates for a vacant full-time position to be part of a multi-disciplinary research team devoted to develop and promotion of innovative and highly complementary technologies to improve insect pest management and sustainable crop production. More information about our research can be found on the following website: http://chrnansen.wix.com/nansen2.

  We were awarded a three-year grant, entitled: "ENHANCEMENT OF SPECIALTY CROP SEED GERMINATION, SEEDLING VIGOR, AND PEST MANAGEMENT USING COLD PLASMA TECHNOLOGY". The grant involves collaboration between University of California Davis (principal investigator), University of Minnesota, University of Maryland, and Cornell University, and we will demonstrate and disseminate solutions to enhancement of seedling plug productions and of pest and disease management through optimized cold plasma treatments of specialty crops seeds.

  We are seeking highly qualified candidates within a rather broad spectrum of qualifications, but the following are considered essential requirements: 1) track-record of publications in internationally recognized and peer-reviewed research journals, 2) track-record of in-depth knowledge about experimental designs in research studies, 3) track-record of experience with statistical data analyses and basic programming in R or similar software packages, and 4) track-record of being involved in complex research and ability to solve practical and/or theoretical challenges. You may have expertise and practical knowledge about use of cold plasma technology, and you meet the abovementioned requirements. You may have ag-engineering expertise and therefore apply, because you have expertise in use and development of technologies, but you may be less familiar with cold plasma technology per se, and you may have limited experience with greenhouse production systems and pest management. You may be a biologist with expertise in programing and statistical analyses and have a strong publication record, and you may have some level of familiarity with pest management. Or you may have a different set of skills and expertise, which is compelling and therefore makes you a highly suitable candidate for the vacant position.

  Formal application is done by following this link: https://recruit.ucdavis.edu/JPF04947.

  Contact:
  Prof. Christian Nansen
  University of California at Davis, USA
  chrnansen@ucdavis.edu

- **Post-doctoral Position in Plasma Processing Science, University of Houston, USA**

  We have an experimental postdoctoral position available, starting immediately. The funded project involves plasma etching studies and will be very fundamental in nature, producing publications that will address etching mechanisms in microelectronics fabrication. Several optical spectroscopies, surface analysis, and laser-based diagnostic techniques will be employed to study both plasma chemistry and plasma-surface interactions. Candidates interested in academic research are particularly encouraged. Candidates for this position must have a Ph.D. (or equivalent) degree in Engineering, Physics, or Chemistry. Experience with plasma diagnostics is highly desired. The starting salary will be commensurate with experience and qualifications. Applicants should send inquiries to Prof. Donnelly.

  Contact:
  Prof. Vincent M. Donnelly
  University of Houston, USA
  vmdonnelly@uh.edu

- **Post-doctoral Appointee, Experimental Low Temperature Plasma Physics, Sandia National Laboratories, Albuquerque, NM, USA**

  The Applied Optical and Plasma Science Department is seeking a Postdoctoral Appointee to conduct experimental research on low temperature plasmas for a wide range of applications. You will assist in driving the development of diagnostic techniques leading to scientific insights and aid Sandia in its mission to serve the nation. You will interrogate a variety of plasma systems increasing our ability to understand the process of electrical breakdown and work in collaboration with members of our computational plasma physics team to increase our fundamental knowledge of these systems.

  - Establish new scientific insight on the physical mechanisms underlying low temperature plasma phenomena.
  - Publish scientific results and participate in the scientific community.
  - Collaborate with external partners.

  Qualifications we require:

  - PhD in Physics, Electrical Engineering, Nuclear Engineering, Mechanical Engineering, Chemistry, or closely related field.
  - Experience in setting up and operating experimental systems to study plasma generation, including diagnostics and plasma sources.
  - Experience with experiments in one or more of the following areas: electrical discharge (vacuum to atmospheric pressures, low to high currents), semiconductor processing, plasma-surface interactions, dusty plasma, gas/plasma chemistry, laser-surface interactions, hydrodynamics, plasma catalysis, or solid-state physics.
  - Able to acquire a DOE security clearance.

  See Sandia Careers Website for full details:
  https://sandia.jobs/albuquerque-nm/experimental-low-temperature-plasma-physics-postdoctoral-appointee/42577A79C0544B9BA14A97E090B53273/job/

  Contact:
  Dr. Brian Bentz
  Sandia National Laboratories, USA
  bzbentz@sandia.gov

Collaborative Opportunities

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

Disclaimer

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