

# 22<sup>ND</sup> WELTPP

*Workshop on the Exploration of Low Temperature Plasma Physics*



**November 28 and 29, 2019**

**"Rolduc"**

**Kerkrade, the Netherlands**

Jointly sponsored and organized by

**RUHR  
UNIVERSITÄT  
BOCHUM**

**RUB**

**TU/e** **EINDHOVEN  
UNIVERSITY OF  
TECHNOLOGY**

**UNIVERSITY of York**

**b.tu** Brandenburg  
University of Technology  
Cottbus - Senftenberg

 **DIFFER**  
Dutch Institute for  
Fundamental Energy Research

  
**LEUPHANA**  
UNIVERSITÄT LÜNEBURG

 **SFB-TR 87**

**SFB**  
1316

 **Ocean  
Insight**

# 22<sup>ND</sup> WELTPP

## *Workshop on the Exploration of Low Temperature Plasma Physics*

Welcome to the 22<sup>nd</sup> *Workshop on the Exploration of Low Temperature Plasma Physics* (WELTPP-22). This workshop is intended for active scientists working in the field of low temperature plasma physics.

The aim of this workshop is to create a forum for young low temperature plasma scientists, that is graduate students and postdoctoral researchers, to meet, learn from each other, exchange knowledge, present results and establish new contacts. The emphasis is on the presentation of the work of the people new in this field.

The workshop is jointly sponsored and organised by the Research Department Plasmas with Complex Interactions of the Ruhr-Universität Bochum (RUB) in in the framework of SFB-TR 87 and SFB CRC 1316 and the Applied Physics Department of Eindhoven University of Technology (TU/e).

**WELTPP** was born in close collaboration between the research groups in Eindhoven and Bochum, that are Plasma and Materials Processing (*PMP, TU/e*), Elementary Processes in Gas Discharges (*EPG, TU/e*), The Institute of Theoretical Electrical Engineering (*TET, RUB*), and The Institute for Electrical Engineering and Plasma Technology (*AEPT, RUB*). Some years ago York Plasma Institute (*YPI*) and the Dutch Institute for Fundamental Energy Research (*DIFFER*) joined the organisers. Since former members of the organising committee have found their own new challenges also Leuphana University of Lüneburg and Brandenburg University of Technology Cottbus-Senftenberg (*btu*) are now among the co-organisers.

Also this year **WELTPP-22** is also kindly supported by Ocean Optics.

### **Local Organisers**

Jeanne Loonen (Eindhoven University of Technology)  
Stefan Welzel (DIFFER)

### **Advisory committee**

Stefan Welzel (DIFFER)  
Jan van Dijk (Eindhoven University of Technology)  
Richard Engeln (Eindhoven University of Technology)  
Maximilian Klich (Ruhr-University Bochum)  
Jens Oberrath (Leuphana University of Lüneburg)  
Jan Trieschmann (Brandenburg University of Technology Cottbus-Senftenberg)  
Erik Wagenaars (York Plasma Institute at University of York)



# Programme WELTPP at Rolduc, November 28 and 29, 2019

*Thursday, November 28<sup>th</sup>*

10:30 Registration (coffee/tea in the Foyer)  
10:55 Opening

<b>Session 1</b>	<b>Pulsed plasmas at elevated pressures</b>	(Conference room 4)
11:00-11:30	T01 <b>Pulsed power technology for transient plasma applications at EUT</b> T. Huiskamp (Eindhoven University of Technology)	
11:30-11:50	O01 <b>Advanced streamer imaging techniques</b> S. Dijcks (Eindhoven University of Technology)	
11:50-12:10	O02 <b>Discharge inception in the repetitive pulsed high-voltage experiments and particle-in-cell simulations</b> S. Mirpour (Eindhoven University of Technology)	
12:10-12:30	O03 <b>Spatially filamentary plasma propagation of a gridded dual planar surface dielectric barrier discharge</b> R.T. Nguyen-Smith (Ruhr-University Bochum)	

12:30 Lunch (“Grote Eetzaal”)

<b>Session 2</b>	<b>Recent developments in modelling</b>	(Conference room 4)
14:00-14:30	T02 <b>Control of electron, ion and neutral heating in radio-frequency hollow cathodes</b> J.P. Dedrick (York Plasma Institute)	
14:30-14:50	O04 <b>Boundary sheath models in plasma simulation</b> M. Klich (Ruhr-University Bochum)	
14:50-15:10	O05 <b>Linearly transformed discretization schemes for numerical simulations</b> C.E.M. Schoutrop (Eindhoven University of Technology)	
15:10-15:30	O06 <b>A C++ version of the LisOn KInetics Boltzmann Solver (LoKI-B)</b> D. Boer (Eindhoven University of Technology)	

15.30 Break with coffee/tea (Foyer)  
(incl. demo from *OceanInsight*)

<b>Session 3</b>	<b>Plasma diagnostics</b>	(Conference room 4)
15:40-16:00	O07 <b>A modulation technique for RFEA measurements</b> C. Lütke Stetzkamp (Ruhr-University Bochum)	
16:00-16:20	O08 <b>Charge control of airborne micro-particles in a shielded afterglow</b> B. van Minderhout (Eindhoven University of Technology)	
16:20-16:40	O09 <b>Spoke-triggered OES measurements of HiPIMS discharges</b> P.A. Maaß (Ruhr-University Bochum)	
16:40-17:00	O10 <b>Measuring plasma density: microwave interferometry versus microwave cavity resonance spectroscopy</b> T.J.A. Staps (Eindhoven University of Technology)	

17:00-18:15 P01 **Poster session I** (Conference room 2)  
Poster numbers P1 – P14 can be posted from 12:30 o'clock.

<b>Session 4</b>	<b>Plasmas: large &amp; small</b>	(Conference room 4)
18:15-18:45	T03 <b>EUV-induced Plasma in EUV Scanners: Friend and Foe</b> M. van de Kerkhof (ASML)	
18:45-19:30	I <b>Mass spectrometry and plasma chemistry of atmospheric pressure plasma jets</b> J. Benedikt (Christian-Albrechts-Universität zu Kiel)	

19:30 Dinner (incl. open bar)



*Friday, November 29<sup>th</sup>*

**07:00-09:00**                      **Breakfast in the “Grote Eetzaal”**

*Please return your room key to the reception before attending the first morning session!*

<b>Session 5</b>	<b>Atmospheric pressure plasma jets</b>	(Conference room 4)
<b>09:00-09:30</b>	T04 <b>From plasma bulk to surface interaction: atmospheric pressure plasmas in focus</b> J. Golda (Christian-Albrechts-Universität zu Kiel)	
<b>09:30-09:50</b>	O11 <b>Characterization of a kHz atmospheric pressure plasma jet: comparison of discharge propagation parameters in experiments and simulations</b> M. Hofmans (Eindhoven University of Technology)	
<b>09:50-10:10</b>	O12 <b>The influence of a Copper target on an atmospheric Helium plasma jet</b> O.J.A.P. van Rooij (Eindhoven University of Technology)	
<b>10:10-10:40</b>	T05 <b>Combining experiments and simulations in plasma medicine: what can we learn?</b> A.R. Gibson (Ruhr-University Bochum)	
<b>10:40</b>	<b>Break with coffee/tea</b>	(Foyer)
<b>10:45-12:15</b>	P02 <b>Poster session II</b> All poster numbers greater than P14 can be posted	(Conference room 2)
<b>12:15</b>	<b>Lunch</b>	(“Grote Eetzaal”)
<b>Session 6</b>	<b>Vibrationally excited molecules</b>	(Conference room 4)
<b>13:45-14:15</b>	T06 <b>Dark energy in molecular plasmas</b> V. Guerra (Instituto Superior Técnico)	
<b>14:15-14:35</b>	O13 <b>Vibrational excitement: from CO<sub>2</sub> to CO</b> Q. Ong (DIFFER)	
<b>14:35-14:55</b>	O14 <b>Zero-dimensional simulation of He and He/O<sub>2</sub> microscale atmospheric pressure plasma jet: Role of the vibrationally excited O<sub>2</sub></b> Y. He (Ruhr-University Bochum)	
<b>14:55</b>	<b>Break with coffee/tea</b>	(Foyer)
<b>Session 7</b>	<b>Fields &amp; Ionisation waves</b>	(Conference room 4)
<b>15:00-15:20</b>	O15 <b>Two-dimensional simulations of a water-confined laser shock peening</b> V. Pozdnyakov (Leuphana University Lüneburg)	
<b>15:20-15:40</b>	O16 <b>Ro-vibrational distribution measurements in transient atmospheric pressure plasmas by coherent anti-Stokes Raman scattering</b> J. Kuhfeld (Ruhr-University Bochum)	
<b>15:40-16:00</b>	O17 <b>Electric field measurements on plasma bullets with electric field induced second-harmonic generation</b> A. Limburg (Eindhoven University of Technology)	
<b>16:00</b>	<b>Closure of the workshop</b>	



## List of Posters

**Thursday, 28th November 2019**

- P01: Spatial calibration of the frequency response of a SDBD setup for precise high voltage measurements in the MHz regime**  
F. Beckfeld, R.T. Nguyen-Smith, L. Schücke, A. R. Gibson, J. Schulze, P. Awakowicz
- P02:  $Zr_xO_y$  based layers investigated by  $3\omega$  method**  
V. Bedarev, P.A. Maaß, M. Prenzel, M. Böke, A. von Keudell
- P03: Numerical modelling of helium radio-frequency atmospheric pressure plasma jets**  
T. de Haan, T.J.A. Staps, D. Mihailova, J. van Dijk
- P04: Modeling of a surface dielectric barrier discharge (SDBD) plasma source by means of the PLASIMO code**  
G. Bonafè, F. Capelli, J. van Dijk, M. Gherardi, V. Colombo
- P05: Modeling complex plasma mixtures with PLASIMO**  
The PLASIMO team<sup>1,2</sup>
- P06: Time-resolved spectral shift of quantum dot photoluminescence in a low pressure RF-CCP**  
T. Donders, L. Bogaers, Z. Marvi, and J. Beckers
- P07: Raman scattering on spatial plasma afterglow**  
M. Duchañ, S. Dijke, S. Nijdam, P. Synek
- P08: Model-based investigation of the magnetic asymmetry effect**  
D. Engel, L. Kroll, M. Oberberg, D. Eremin, B. Berger, J. Schulze, P. Awakowicz, R.P. Brinkmann
- P09: Quasi-1D approximation for streamer dynamics**  
H. Francisco, B. Bagheri, J. Teunissen, U. Ebert
- P10: Characterization of a surface dielectric barrier discharge (SDBD) for purification of gas streams by conversion of volatile organic compounds (VOC)**  
J.-L. Gembus, L. Schücke, N. Peters, K. Ollegott, M. Muhler, P. Awakowicz
- P11: Raman spectroscopy on plasma assisted combustion**  
T.G. Gijbels, J.E.H. Pelders, R.B. Patel, S. Nijdam, N.J. Dam

**P12: Determination of the electron density of spark plasmas in a helium nitrogen mixture using line broadening methods**

S. Groeger, M. Hamme and P. Awakowicz

**P13: Plasma chemical reduction based on pathway analysis**

J.G.M. Gulpen, S. Tadayon Mousavi, J. van Dijk, D.B. Mihailova

**P14: A Systematic Comparison of Iterative Matrix Solvers**

L. Kuijpers, C.E.M. Schoutrop, J. van Dijk

## Friday, 29th November 2019

- P15: **Research into Geometric Properties of Streamers**  
M. Bieling, S. Dijcks, S. Nijdam
- P16: **Investigating negative ions in oxygen RF plasma with laser-induced photodetachment**  
M. Hasani, Z. Marvi, J. Beckers
- P17: **A Pathway to Efficient Plasma Assisted Combustion**  
T. Hazenberg, J.A. van Oije, J. van Dijk
- P18: **Determination of plasma physical parameters by line broadening in an electrosurgical argon plasma**  
B. Hillebrand, E. Iglesias, A. Gibson, A. Neugebauer, M. Enderle, P. Awakowicz
- P19: **NO production in a volumetric Dielectric Barrier Discharge at atmospheric pressure**  
F. Kogelheide, P. Preissing, N. Bibinov, K. Stapelmann, P. Awakowicz, V. Schulz-von der Gathen
- P20: **Two Dimensional Simulation of a Planar Dielectric Barrier Discharge in Air**  
B. Mahdavi-pour, S. Dahle, J. Oberrath
- P21: **Simulating long streamers in air with different reaction sets**  
A. Martinez, J. Teunissen, U. Ebert
- P22: **Physico-chemical characterization a surface barrier discharge plasma source**  
F. Medini, A. Sobota, V. Colombo, M. Gherardi
- P23: **Probing the plasma sheath with multiple micro waves**  
P. Meijaard, B. Platier, J. Beckers
- P24: **The plasma modelling platform PLASIMO**  
The PLASIMO team
- P25: **Capturing streamer assisted methane ignition**  
R. Patel, J.E.H. Pelders, S. Nijdam, N.J. Dam
- P26: **Sheath potential influence on electron energy probability functions for modeling the plasma kinetics**  
T. Samir

**P27: Fast optical and electrical measurements at a single microdischarge setup during plasma electrolytic oxidation (PEO)**

A.-L. Schoene, V. Bracht, P. Hermanns, P. Awakowicz

**P28: Pulsed laser discharges for use in streamer initiation**

W. Slot, S. Mirpour, S. Nijdam

**P29: Measuring electron density: microwave interferometry versus microwave cavity resonance spectroscopy**

T.J.A. Staps, B. Platier, P. Meijaard, J. Berndt, E. Kovacevic, J. Beckers

**P30: Collision-less Kinetic Modeling and Simulation of the Planar Multipole Resonance Probe**

C. Wang, M. Friedrichs, J. Gong, J. Oberrath, R.P. Brinkmann