



# WORKSHOP PROGRAM



## **2<sup>nd</sup> International Workshop**

**“Plasma Chemical Technologies as the Important Approach to the  
(Nano)Materials and Hydrogen Production (PLASCHEMAT)”**

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**Marianská**

**9-12.6.2025**

## AIMS, MESSAGE AND FUTURE VISION

The workshop has been held on 1-2.7.2024 for the first time. Back then it summoned 25 experts from different branches of knowledge and different countries including Czech Republic, Poland, Germany, Italy, Estonia, Serbia. Representatives of science and industry were present. This event resulted in the establishment of several important cooperations between the scientific and industrial institutions: international consortia were created, and several joint projects were applied for.

The **core message** of the workshop is: “Harnessing the power of plasma to drive cleaner, smarter, and more efficient chemical transformations”. Plasma chemical technologies bridge the gap between physics and chemistry leading to the efficient material engineering, offering a disruptive platform to address global industrial and environmental challenges. The message underscores plasma’s potential to make production processes not only more efficient but also more sustainable and adaptable to future needs. The main accent is put on environmental sustainability, innovation in material processing and process efficiency and selectivity. Therefore, the workshop **is aimed** at bringing together experts of many fields of knowledge both scientific and industrial, to discuss the market needs and work out the effective response to the existing hurdles.

The **future vision** is broadening the impact of the workshop through extending the impact of this meeting to the level of the international conference. The following aspects will be considered. (i) *Circular Economy Integration*. Plasma technologies will play a central role in turning waste (plastic, CO<sub>2</sub>, biomass) into reusable chemicals and fuels, fostering a closed-loop industrial ecosystem. (ii) *Decarbonization of Industry*. As industries face pressure to meet carbon neutrality goals, plasma processes will offer low- or zero-emission alternatives to traditional combustion-based systems. (iii) *Plasma for Green Hydrogen and Ammonia*. Emerging plasma technologies can produce hydrogen and ammonia without relying on fossil fuels, supporting the global hydrogen economy. (iv) *On-Demand, Decentralized Production*. Miniaturized, plasma-based reactors will enable on-site and on-demand chemical manufacturing, reducing transportation emissions and increasing supply chain resilience. (v) *Integration with AI and Smart Control Systems*. Combining plasma systems with artificial intelligence and internet of things will lead to self-optimizing chemical reactors that adapt in real time to changing inputs and conditions.

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## ACKNOWLEDGEMENTS

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## PARTICIPANTS

### Staff of the Plasma Chemical Technologies Department, Institute of Plasma Physics of the Czech Academy of Sciences

|                                |                   |                 |
|--------------------------------|-------------------|-----------------|
| Dr. hab. Maksym Buryi (Head)   | Dr. Oldřich Živný | Zdeňka Tomášová |
| Dr. Alan Mašláni (Deputy head) | Jafar Fathi       | Dominik Kralik  |
| Dr. Shelja Sharma              | Tomáš Hostinský   | Petr Brom       |
| Dr. Michal Hlína               | Jan Zich          | Antonín Musil   |
| Dr. Jiří Jeništa               | Ondřej Šot        | Václav Březina  |
| Dr. Prokhorov                  | Jakub Pilař       | Zdeněk Zábanský |
| Dr. Brenda Natalia Lopez-Niño  |                   |                 |

### External experts

Prof. A. Popov (Institute of Solid-State Physics, University of Latvia, Riga, **Latvia**)  
 Prof. F. Průša (University of Chemistry and Technology in Prague, Prague, **Czech Republic**)  
 Prof. M. Piasecki (Jan Dlugosz University in Czestochowa, Czestochowa, **Poland**)  
 Prof. M. Brik (Institute of Physics, University of Tartu, Tartu, **Estonia**)  
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 Dr. R. Tomala (Faculty of Chemistry and Geosciences, Vilnius University, Vilnius, **Lithuania**)  
 Dr. M. Konuhova (Institute of Solid-State Physics, University of Latvia, Riga, **Latvia**)  
 Dr. A. Racu (National Institute of Research and Development for Electrochemistry and Condensed Matter, Timisoara, **Romania**)  
 Dr. T. Mates (Company HVM Plasma Ltd., Prague, **Czech Republic**)  
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 M. Rott (COMTES FHT a.s., Plzen, **Czech Republic**)  
 J. Kulas (Company ÚJV Řež a.s., Řež, **Czech Republic**)

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## ORGANIZING COMMITTEE

Dr. hab. Maksym Buryi, Ph.D. (Chair)  
 Dr. Alan Mašláni (Co-Chair)  
 Dr. Michal Hlína (Secretary)  
 Dr. Shelja Sharma (Member)  
 Dr. Brenda Natalia Lopez-Niño (Member)  
 Tomáš Hostinský (Member)  
 Jan Zich (Member)  
 Jakub Pilař (Member)



## INTERNATIONAL ADVISORY BOARD

Dr. hab. Maksym Buryi (Institute of Plasma Physics, Prague, Czech Republic) – Chair  
Prof. A. Popov (Institute of Solid-State Physics, University of Latvia, Riga, Latvia) - member  
Prof. M. Piasecki (Institute of Jan Dlugosz University in Czestochowa, Czestochowa, Poland) – member  
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Dr. R. Tomala (Institute of Low Temperature and Structure Research, Polish Academy of Sciences, Wroclaw, Poland) - member  
Dr. M. Konuhova (Institute of Solid-State Physics, University of Latvia, Riga, Latvia) – member  
R. Pjatkan (Association of Chemical Industry of the Czech Republic) – member

## THE WORKSHOP TOPICS

Plasma techniques and methods of plasma investigation;  
Plasma Physics and Chemistry;  
Solid-State Physics and Chemistry;  
Physical Chemistry;  
Quantum Physics and Chemistry;  
Materials Engineering including nano-, micro- and macromaterials;  
Methods of materials investigation

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## TALK LENGTH

Oral talk: 15 minutes (talk) + 5 minutes (questions)  
Invited talk: 25 minutes (talk) + 5 minutes (questions)

## OFFICIAL LANGUAGES: ENGLISH, CZECH



## **SCHEDULE AND PROGRAMME**

### **Monday 9.6.2025**

**10:30-11:30** – Tour de labs. Visiting of the laboratories of the Plasma Chemical Technologies Department of the Institute of Plasma Physics of the Czech Academy of Sciences. Discussions.

**11:30-13:00** – Lunch at the restaurant “Cobolis”.

**13:00-15:30** – Embarkment. Trip to Mariánská (Popovská 83):

<https://www.google.com/maps/@50.3558917,12.8959592,88m/data=!3m1!1e3?entry=ttu>

**15:30-16:00** – Accommodation in the cottage.

**16:00-16:15** – Workshop opening, welcome speech (M. Buryi).

**16:30-18:30** – Session I - INVITED TALKS (4 people). Chairperson: M. Buryi

16:30-17:00 – **F. Průša**. *Utilization of waste by-products from high-power microwave plasma gasification for the carbide-reinforced high-entropy alloys*

17:00-17:30 – **K. Šíma**. *Low-grade plastic waste for thermal plasma pyrolysis*

17:30-18:00 – **J. Kulas**. *Use of a methanation unit in a wastewater treatment plant*

18:00-18:30 – **M. Rott**. *3D printing options at the COMTES FHT research organisation*

**19:00-22:00** – Networking



**Tuesday 10.6.2025**

**08:30-09:30** – Breakfast

**09:30-11:00** – Session II - INVITED TALKS (3 people). Chairperson: A. Mašláni

09:30-10:00 – **M. Buryi**. *Nanomaterials for dosimetry in space*

10:00-10:30 – **A. Popov**. *Radiation effects in functional ceramics for nuclear applications*

10:30-11:00 – **R. Tomala**. *Luminescent nanoparticles for white light generation*

11:00-11:30 – Coffee break

**11:30-13:00** – Session III (4 people). Chairperson: K. Bartosiewicz

11:30-12:00 – S. Sharma. *Doping strategies in carbon, quantum dots: mechanisms and applications*

12:00-12:20 – Z. Tomášová. *WSP-H Plasma Torch: Function, Design, and Physics*

12:20-12:40 – T. Hostinský. *Artificial Intelligence in Science: Fad or Necessity?*

12:40-13:00 – J. Zich. *Possibilities of growth of bulk  $\text{Bi}_2\text{O}_2\text{Se}$  single crystals*

**13:00-18:00** – Lunch at the restaurant “U Švejka” and social program in Karlovy Vary.

[https://www.google.com/maps/place/U+%C5%A0vejka/@50.2223252,12.8792354,508m/data=!3m2!1e3!4b1!4m6!3m5!1s0x47a0995b375bb74f:0x4a5967950bde9cd!8m2!3d50.2223218!4d12.8818103!16s%2Fg%2F1tjz2c9y?entry=tту&g\\_ep=EgoyMDI1MDUyOC4wIKXMDSOASAFQAw%3D%3D](https://www.google.com/maps/place/U+%C5%A0vejka/@50.2223252,12.8792354,508m/data=!3m2!1e3!4b1!4m6!3m5!1s0x47a0995b375bb74f:0x4a5967950bde9cd!8m2!3d50.2223218!4d12.8818103!16s%2Fg%2F1tjz2c9y?entry=tту&g_ep=EgoyMDI1MDUyOC4wIKXMDSOASAFQAw%3D%3D)

**19:00-22:00** – Networking.

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**Wednesday 11.6.2025**

**08:30-09:30** – Breakfast

**09:30-11:00** – Session IV - INVITED TALKS (3 people). Chairperson: M. Hlína

09:30-10:00 – **Z. Remeš.** *Optical, electrical and surface properties of bare and Al-doped nanocrystalline ZnO thin films prepared by pulsed laser deposition on interdigital electrodes*

10:00-10:30 – **K. Bartosiewicz.** *Engineering Crucible Construction to Control Atomic Segregation and Scintillation Efficiency in  $\text{Pr}^{3+}$ -Doped Lu-Y-Al-Sc Garnet Single Crystals*

10:30-11:00 – **A. Racu.** *Local symmetry and interatomic distances in lanthanide-doped  $\text{A}_2\text{O}_3$  oxides: Machine Learning predictions and correlations with Stark splitting of energy levels*

11:00-11:30 – Coffee break

**11:30-13:00** – Session V (4 people). Chairperson: A. Racu

11:30-12:00 – **T. Mates** (INVITED). *Regimes of MW plasma torch for waste processing and  $\text{H}_2$  production*

12:00-12:20 – J. Fathi. *Microwave plasma assisted graphene production*

12:20-12:40 – O. Živný. *Thermodynamic equilibrium for modelling processes in plasma reactors*

12:40-13:00 – J. Jeništa. *Thermal plasma gasification of wood*

**13:00-16:30** – Lunch at the restaurant “Na Sluníčku” and sightseeing tour.

<https://mapy.com/cs/turisticka?source=firm&id=12970052&x=12.8962784&y=50.3570206&z=17>

**16:30-18:20** – Session VI - (4 people). Chairperson: T. Mates

16:30-17:00 – **M. Konuhova** (INVITED). *Liquid piston systems for hydrogen compression*

17:00-17:20 – J. Pilař. *Heat losses of thermal plasma reactor*

17:20-17:40 – B. N. Lopez-Niño. *WEEE Mixed Plastics Characteristics Pre- and Post-Plasma Chemical Treatment*

17:40-18:00 – O. Šot. *Hydrogen and solid carbon production by plasma pyrolysis of natural gas*

18:00-18:20 – A. Mašláni. *Plasma gasification - is air plasma a way to go?*

**19:00-22:00** – Networking

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**Thursday 12.6.2025**

**08:30-09:30** – Breakfast

**09:30-10:10** – Session VII (3 people). Chairperson: B. N. Lopez-Niño

09:30-09:50 – D. Kralik. *Rootchip development - adaptation to different plant species*

09:50-10:10 – M. Hlína. *Principles of quadrupole mass spectrometry and its role in the gasification/pyrolysis experiments*

10:10-10:30 – Coffee break

**10:30-13:00** – Session VIII Discussions. The topic: Electrical wiring and power supply of the heating element and plasma torch – challenges. Responsible persons: **Vaclav Březina, Petr Brom, Antonín Musil**

**13:00-14:30** – Lunch at the restaurant “Na Sluníčku”.

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**14:30-15:00** – Workshop closing