Program Book

AEPSE 2025 Asian-European International Conference on Plasma Surface Engineering | ICSE & R-INTERFINISH International Conference on Surface Engineering and Regional Interfinish (Thailand)

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AEPSE 2025 &

14th Asian-European International Confernce on Plasma Surface Engineering
International conference on Surface Engineering (ICSE 2025) and Regional INTERFINISH 2025

ICSE and Regional INTERFINISH

November 2-6, 2025

Courtyard Phuket Town, Phuket, Thailand

Organized & Co-Organized by

- Asian Joint Committee for Applied Plasma Science and Engineering
- Thailand Electroplating Industrial Network Association (TEPNET)
- European Joint Committee for Plasma and Ion Surface Engineering
- The Korean Society of Surface Science and Engineering (KSSSE)
- Science and Technology Park, Chiang Mai University (STeP)
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E-Abstract

Scientific Program

Program
Plenary Speakers
Keynote Speakers
Invited Speakers
Topical Workshops
Tutorial Lectures

Gallery

AEPSE 2023 Asian-European International Conference on Plasma Surface Engineering

Invited Speakers

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Plasma Fundamentals

Name	Affiliation	Nationality	Presentaion title	Bio
Eugen Stamate	DTU Nanolab, Technical University of Denmark	Denmark	Understanding And Tuning The Target-Plasma-Substrate System During The Deposition Of Metal Oxide Thin Films By Magnetron Sputtering	
Tiberiu Minea	University Paris-Saclay	France	Effect of surface phenomena on pulsed magnetron plasma and novel ways for power injection	
Shota Nunomura	National Institute of Advanced Industrial Science and Technology(AIST)	Japan	Initial process of surface modification of silicon by rare-gas plasma processing	
Takayuki Watanabe	Kyushu University	Japan	Determination Of Temperature And Density Of Lithium Vapor In Thermal Plasmas For Lithium-Ion Battery Materials	

Coatings and Thin Films

Name	Affiliation	Nationality	Presentaion title	Bio
Yu-Lin Kuo	MNational Taiwan University of Science and Technology	Taiwan	Powering Surface Treatment of Engineering Materials by Atmospheric Pressure Plasma for Nitrogen Doping/Nitriding	
Jyh-Ming Wu	National Tsing Hua University	Taiwan	2D Materials Piezocatalysts: Energy and Environmental Remediations	
Matjaz Godec	Institute Of Metals And Technology	Slovenia	Plasma Nitriding of Metal Materials Produced by Powder Bed Fusion for Improved Tribological and Corrosion Performance	
Dermot Monaghan	Gencoa Ltd.	United Kingdom	From highly ionised vapour to fusion reactor control, how Vacuum Plasma Technology is meeting the demands of industry	
Pung Keun Song	Pusan National University	Korea	Performance Of Wide Gap Semiconductor Using Hybrid Structure	

Ralf Bandorf	Fraunhofer Institute for Surface Engineering and Thin Films IST	Germany	Challenges and Impact of Reactive HIPIMS for Future Industrial Processes	
Mineo Hiramatsu	Meijo University	Japan	Synthesis and Functionalization of 3D Graphene-Based Materials	
Petr Vasina	Masaryk University	Czech Republic	Exploring Ionized Metal Flux Fraction in Magnetron Sputtering: Insights from Laboratory and Industrial Applications	
Phitsanu Poolcharuansin	Mahasarakham University	Thailand	Energy Distribution of Negative Ions in Reactive Magnetron Sputtering	

Energy and Environment

Name	Affiliation	Nationality	Presentaion title	Bio
Naoki Shirai	Hokkai University	Japan	Generation of energy carriers by atmospheric pressure plasma-induced electrolysis	
Makoto Kambara	Osaka University	Japan	Novel Closed Loop Of Aluminum Alloy Powders For Metal Additive Manufacturing By Mesoplasma Rejuvenation	
G. van Rooij	Maastricht University	Netherlands	Plasma Chemistry for the Energy and Materials Transition of the Process Industry	
Yong Sup CHOI	Korea Institute of Fusion Energy	Korea	Plasma Technology Research at KFE-IPT for a Sustainable Future	
Zdenko Machala	Comenius University Bratislava	Slovakia	Purification of indoor air by non-thermal DBD plasma combined with photocatalysis	
Karol Hensel	Comenius University Bratislava	Slovakia	Honeycomb Discharge – Its Physical Properties and Chemical Potential for Environmental Applications	
Rony Snyders	Université de Mons	Belgium	Experimental Study of Hydrocarbons Pyrolysis in a Planar Atmospheric Gliding Arc Discharge	
Satyananda Kar	ndian Institute of Technology Delhi	India	Graphite Electrode-based Plasma Gasification for Municipal Solid Waste Treatment	

Bio, Medicine and Agriculture

Name	Affiliation	Nationality	Presentaion title	Bio
Koichi Takaki	Iwate University	Japan	Function of high-voltage stimulation on fruiting body formation of Basidiomycota	
Augusto Stancampiano	University of Orleans	France	Cold plasma and Artificial Intelligence: a new technique for the classification of biological tissue	
Clara Tran	The University of Sydney	Australia	Radical-rich surfaces via Plasma treatments: Enabling innovations in Biomedical and Biotech applications	
Marian Lehocky	Tomas Bata University in Zlín	Czech Republic	Plasma Polymerization of Recycled PLA Esters: A Green Strategy for Functional and	

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Purification of indoor air by non-thermal DBD plasma combined with photocatalysis

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Indoor air contains many harmful contaminants (chemical pollutants, bio-pathogenic aerosols, tobacco smoke, etc.) that can cause respiratory, cardiovascular, and oncological diseases under long-term exposure. Many hospital-acquired infections are also spread through air contaminants. Finding an innovative technology that would efficiently remove all airborne pollutants without producing harmful by-products and with a low energy cost would be a major advance for public health. It would also help to prevent the spread of airborne pathogens such as the recent COVID-19 pandemic. Contrary to traditional filters that just trap the contaminants, the goal of this work is to develop non-thermal plasma DBD technology combined with UV-induced photocatalysis for the removal of volatile organic compounds (VOC) [1], fine and ultrafine particulate matter, and inactivation of aerosol-borne bacteria at high gas flow rates relevant for real indoor settings.

We designed an indoor air decontamination device that combines a DBD and a TiO_2 coating activated on-demand by UV-C lamps or UV-A LEDs. The device uses a very short residence time of the pollutant in the reactor: the gas flow rate is high (>120 L/min), and uses a single-pass method. The chemical analysis of the VOC contaminants (formaldehyde) and the gaseous products by the DBD was performed by FTIR absorption spectroscopy. The water aerosol-borne bacteria *E. coli* and *S. aureus* were collected after a single-pass on Petri dishes and evaluated by thermostatic cultivation.

Formaldehyde stock solution always contains methanol; hence its removal is associated with methanol decomposition. The formaldehyde removal efficiency depends strongly on the air relative humidity, varying from 30 to 50% at 120 L/min air flow rate in the single pass. Higher humidity is favorable for the decomposition of ozone generated by the DBD, which should be decomposed by the photocatalytic process before exiting the device. The obtained decontaminations of bio-aerosols are very promising: 3.73 log (99.98%) and 3.32 log (99.95%) inactivation of water aerosol-borne *E. coli* and *S. aureus*, respectively [2].

In summary, we developed a new device for indoor air purification efficient for chemical (VOC, fine and ultrafine particles) and biological decontamination. It employs combined effects of DBD plasma and UV activated TiO_2 photocatalysis. The device can operate at high gas flow rates (>120 L/min). High inactivation of both organic chemical pollutants and airborne bio-pathogens was achieved at a low specific input energy. This combined NTP-photocatalysis technology can be applied in multiple indoor settings, such as hospitals and public spaces, as well as in potential manned space missions.

KEYWORDS: indoor air purification, VOC, bio-pathogenic aerosol, DBD plasma, TiO_2 photocatalysis

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[1] Destrieux A., Jangra R., Hensel K, Machala Z. *J. Electrostat.,* 137, 104153 (2025)
[2] Vazquez T. Lavrikova A, Wiedermann D, Babic J, Palko M., Palko M., Machala Z. *J. Electrostat.,* 138, 104160 (2025)

Invited: **Energy and Environment**