

The 13th International Workshop on Advanced Plasma Processing and Diagnostics

Topical Scope: Plasma Technology for Energy Harvesting and Environment

Date : July 21th (Thu) – 22th (Fri)

Place : Daejeon Convention Center, Deajeon, Korea

Organized by

- Convergence Plasma Research Center, National Fusion Research Institute (NFRI), Korea
- Center for Advanced Plasma Surface Technology (CAPST), SKKU, Korea
- Plasma Bioscience Research Center (PBRC), Kwangwoon University, Korea
- Plasma Nanotechnology Research Center (PLANT), Nagoya University, Japan
- Center of Plasma Nano-interface Engineering (CPNE), Kyushu University, Japan
- Korean Joint Committee for Applied Plasma Science and Engineering, Korea
- Korea Institute of Materials Science (KIMS), Korea

Supported by

- Korea Advanced Institute for Science and Technology (KAIST)
- The Japan Society of Applied Physics, Kyushu Chapter, Japan
- Asian Joint Committee for Applied Plasma Science and Engineering
- Aichi Science and Technology Foundation
(Tokai Region Knowledge Cluster Headquarters), Japan
- Korea Vacuum Society, Korea

Organizing Chairpersons:

Suk Jae Yoo (NFRI, Korea)

Masaru Hori (Nagoya University, Japan)

Vice Organizing Chairperson

Jeon G. Han (CAPST, Korea)

Masaharu Shiratani (Kyushu University, Japan)

Organizing Committee

Hong Young Chang (KAIST, Korea), Jeon Geon Han (SKKU, Korea)

Eun Ha Choi (Kwangwoon University, Korea), Jong G. Kim (KIMM, Korea)

July 21 (Thu)

13:00 - 14:00 Registration

14:00 - 14:10 Opening remarks Hong Young Chang, KAIST, Korea,
Masaru Hori, Nagoya University

2 Plenary Lectures (30min + 10min Q&A)

Session chairperson Hong Young Chang, KAIST, Korea
Masaru Hori, Nagoya University, Japan

14:10 - 14:50 Application of plasma technology for clean diesel
Young-Hoon Song, Korea Institute of Machinery and Materials (KIMM),

14:50 - 15:30 Innovative Si solar cells: new approaches and demonstration of devices
M. Shiratani, K. Koga, G. Uchida, H. Seo, N. Itagaki, K. Kamataki
Kyushu University, Japan

15:30 - 15:45 Break

6 Invited Talks(20 min + 5 min Q&A)

15:45 - 16:10 Possibility of Application of Non-Neutral Plasma Trap to Pure and Uniform
ZnO Quantum Dots
Haruhiko Himura, Kyoto Institute of Technology, Japan

16:10 - 16:35 Inactivation of environmentally hazardous materials using non-thermal
atmospheric pressure plasmas
Wonho Choi, Dan Bee Kim, Heesoo Jung, Bomi Gweon, Se Youn Moon
Korea Advanced Institute Science and Technology, Korea

16:35 - 17:00 Real-time Electron-Spin-Resonance Study of Plasma-Surface interaction
Kenji Ishikawa, Naoya Sumi, Akihiko Kono¹, Hideo Horibe¹,
Keigo Takeda, Hiroki Kondo, Makoto Sekine and Masaru Hori
Nagoya University, ¹Kanawaza Institute of Technology, Japan

17:00 - 17:25 Technique of discharge under water and its application
Taihyeop Lho, S. M. Yoo, E. J. Hong, J. S. Park, S. R. Yoo, Y. J. Kim and D.

C. Seok

Convergence Plasma Research Center, National Fusion Research Institute (NFRI), Korea

17:25 - 17:50 Decomposition Characteristics of an Artificial Biogas in a Low-Pressure Glow Discharge
Kohki Satoh, Muroran Institute of Technology, Japan

17:50 - 18:15 Linear Ion Source with Anode Layer Acceleration for Surface Modifications
Seunghun Lee, Jong-Kuk Kim and Do-Geun Kim
Korea Institute of Materials Science (KIMS), Korea

18:15 Welcome Dinner

July 22 (Fri)

2 Plenary Lectures (30min + 10min Q&A)

Session chairperson Eun. Ha. Choi, Kwangwoon University, Korea
Makoto Sekine, Nagoya University, Japan

09:00 - 09:40 Spatiotemporal measurement of microwave electric field in atmospheric pressure microwave plasma
Hirotaka Toyoda, Takuya Murase and Tatsuo Ishijima
Nagoya University, Japan

09:40 - 10:20 Coal gasification by pure steam plasma torch
Han Sub Uhm¹, Yong C. Hong², Dong H. Shin², Yong U. Shin², Sang J. Lee²,
Ye J. Kim² and Bongju Lee²
¹Kwangwoon University, Korea
²Convergence Plasma Research Center, National Fusion Research Institute (NFRI), Korea

10:20-10:30 Break

5 Invited Talks(20 min + 5 min Q&A)

10:30 - 10:55 Highly Flexible Transparent Conducting Electrode for Organic Solar Cells

Do-Geun Kim, Jae-Wook Jang, Chang Su Kim, Jong-Kuk Kim
Korea Institute of Materials Science (KIMS), Korea

10:55 - 11:20 Development of Inner-Type ICPs for Reactive Large-Area Processes

Yuichi Setsuhara¹ and Akinori Ebe²

¹Joining and Welding Research Institute, Osaka University, Japan

²EMD Corp., Kyoto, Japan

11:20 - 11:45 RF thermal plasma synthesis of Ni based nano-composite catalysts for CH₄ reforming process

Jun Ho Seo, Mi Yeon Lee and Jeong Su Kim

High Enthalpy Plasma Research Center, Chonbuk National University, Korea

11:45 - 12:10 Electric field measurements in high-pressure discharges by coherent Raman scattering

Tsuyohito Ito, Osaka University, Japan

12:10 - 12:35 Etch Rate Uniformity Control by a Dual Turn ICP Source: Numerical Modeling and Experiment

Jung Hoon Joo, Kunsan National University, Korea

12:35 - 13:30 Lunch

13:30 - 14:30 Lab Tour

ITP (International Training Program) Student Workshop (10 min Talk + 5min Q&A)

Organized and proceeded by students

Session chairperson Min Park, KAIST, Korea

Hironao Shimoeda, Nagoya University, Japan

12 students presentation (10min + 5 min Q&A)

14:30 - 14:45 A study on solid-liquid separation of the humic substances in wastewater effluent using underwater plasma discharge

Eun Jung Hong^{1,2}, Seungmin Ryu², Junseuk Park², Seungryul Yoo², Taihyeop Lho² and Bongju Lee²

¹Chonbuk National University and ²Convergence Plasma Research Center,
NFRI, Korea

14:45 - 15:00 Effects of Oxygen Radical Irradiation on Crystalline Structures of Carbon Nanowalls

Hironao Shimoeda¹, Hiroki Kondo¹, Kenji Ishikawa¹, Hiramatsu Mineo²,
Makoto Sekine¹ and Masaru Hori¹

¹Nagoya University, ²Meijo University, Japan

15:00 - 15:15 Formation of silicon quantum dots by hyperthermal neutral beam
Jong Bae Park¹, Kyoung Suk Oh², Daechul Kim², Jong Sik Kim², Young
Woo Kim², Seung Pyo Hong², Jung-Sik Yoon², Suk Jae Yoo² and Bongju
Lee²

¹Kunsan National University, and Convergence Plasma Research Center,
NFRI, Korea

15:15 - 15:30 Highly stable schottky cells using cluster-free a-Si:H deposited by
multi-hollow discharge plasma CVD method

K. Hatozaki, K. Nakahara, G. Uchida, H. Seo, N. Itagaki, K. Koga and
M. Shiratani

Kyushu University, Japan

15:30 - 15:45 On the behavior of metastable argon atom density in high density Ar
discharge

Min Park¹ and Hong-Young Chang¹, Shin-Jae You², Jung-Hyung Kim² and
Yong-Hyeon Shin²

¹KAIST, and ²Korea Research Institute of Standard and Science, Korea

15:45 - 16:00 Flowing Liquid Treatment by Microwave Plasma

Koji Kanetake, Tatsuo Ishijima and Hirotaka Toyoda,
Nagoya University, Japan

16:00 - 16:10 Break

16:10 - 16:25 BREAKDOWN ELECTRON TEMPERATURE IN LIQUID-IMMERSED
ELECTRODES BY HIGH VOLTAGE PULSES

Yong Seong Byeon, Ki Baek Song, Young June Hong, Guangsupo Cho,
Duk In Choi, and Eun Ha Choi

Department of Electrophysics, Plasma Bioscience Research Center,

Kwangwoon University, Korea

- 16:25 - 16:40 Decomposition of an Artificial Biogas by a Dielectric Barrier Discharge
Kazuhiro Takahashi, Kohki Satoh and Hidenori Itoh
Muroran Institute of Technology, Japan
- 16:40 - 16:55 Gas barrier properties of SiON films deposited as a function of the plasma process parameters at low temperature by PECVD
Joon S. Lee, Su B. Jin, Yoon S. Choi, In S. Choi, Jeon G. Han
Center for Advanced Plasma Surface Technology,
Sungkyunkwan University, Korea
- 16:55 - 17:10 Recovery of plasma-damaged GaN by atomic nitrogen and hydrogen
Shang Chen, Yi Lu, Ryouyusuke Kome, Kenji Ishikawa, Hiroki Kondo,
Keigo Takeda, Hiroyuki Kano², Makoto Sekine and Masaru Hori
Nagoya University, and ²Nu Eco-Engineering Co. LTD., Japan
- 17:10 - 17:25 The influence of plasma parameters on the TCO film growth mechanism in magnetron sputtering
Sung I. Kim, Byeong C. Sim, Yoon S. Choi, In S. Choi, Jeon G. Han
Center for Advanced Plasma Surface Technology
Sungkyunkwan University, Korea
- 17:25 - 17:40 High performance and Reaction Mechanism for Decomposition and Fixation of Dry Etching exhaust Perfluoro-Compound Gases
Kei Hattori^{1, 2}, Makoto Sekine² and Masaru Hori²
¹Toshiba Corp., and ²Nagoya University, Japan
- 17:40 - 18:30 Poster Session (all the subjects presented)
- P1 Application of plasma technology for clean diesel
Young-Hoon Song, Korea Institute of Machinery and Materials (KIMM),
- P2 Innovative Si solar cells: new approaches and demonstration of devices
M. Shiratani, K. Koga, G. Uchida, H. Seo, N. Itagaki, K. Kamataki
Kyushu University, Japan
- P3 Possibility of Application of Non-Neutral Plasma Trap to Pure and Uniform ZnO Quantum Dots

Haruhiko Himura, Kyoto Institute of Technology, Japan

- P4 Inactivation of environmentally hazardous materials using non-thermal atmospheric pressure plasmas
Wonho Choi, Dan Bee Kim, Heesoo Jung, Bomi Gweon, Se Youn Moon
Korea Advanced Institute Science and Technology, Korea
- P5 Real-time Electron-Spin-Resonance Study of Plasma-Surface interaction
Kenji Ishikawa, Naoya Sumi, Akihiko Kono¹, Hideo Horibe¹,
Keigo Takeda, Hiroki Kondo, Makoto Sekine and Masaru Hori
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- P6 Technique of discharge under water and its application
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- P7 Decomposition Characteristics of an Artificial Biogas in a Low-Pressure Glow
Discharge
Kohki Satoh, Muroran Institute of Technology, Japan
- P8 Linear Ion Source with Anode Layer Acceleration for Surface Modifications
Seunghun Lee, Jong-Kuk Kim and Do-Geun Kim
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- P9 Spatiotemporal measurement of microwave electric field in atmospheric
pressure microwave plasma
Hirotaka Toyoda, Takuya Murase and Tatsuo Ishijima
Nagoya University, Japan
- P10 Coal gasification by pure steam plasma torch
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¹Kwangwoon University, Korea
²Convergence Plasma Research Center, National Fusion Research Institute
(NFRI), Korea
- P11 Highly Flexible Transparent Conducting Electrode for Organic Solar Cells

Do-Geun Kim, Jae-Wook Jang, Chang Su Kim, Jong-Kuk Kim
Korea Institute of Materials Science (KIMS), Korea

- P12 Development of Inner-Type ICPs for Reactive Large-Area Processes
Yuichi Setsuhara¹ and Akinori Ebe²
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- P13 RF thermal plasma synthesis of Ni based nano-composite catalysts for CH₄ reforming process
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- P14 Electric field measurements in high-pressure discharges by coherent Raman scattering
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- P15 Etch Rate Uniformity Control by a Dual Turn ICP Source: Numerical Modeling and Experiment
Jung Hoon Joo, Kunsan National University, Korea
- P16 A study on solid-liquid separation of the humic substances in wastewater effluent using underwater plasma discharge
Eun Jung Hong^{1,2}, Seungmin Ryu², Junseuk Park², Seungryul Yoo², Taihyeop Lho² and Bongju Lee²
¹Chonbuk National University and ²Convergence Plasma Research Center, NFRI, Korea
- P17 Effects of Oxygen Radical Irradiation on Crystalline Structures of Carbon Nanowalls
Hironao Shimoeda¹, Hiroki Kondo¹, Kenji Ishikawa¹, Hiramatsu Mineo², Makoto Sekine¹ and Masaru Hori¹
¹Nagoya University, ²Meijo University, Japan
- P18 Formation of silicon quantum dots by hyperthermal neutral beam
Jong Bae Park¹, Kyoung Suk Oh², Daechul Kim², Jong Sik Kim², Young Woo Kim², Seung Pyo Hong², Jung-Sik Yoon², Suk Jae Yoo² and Bongju Lee²

¹Kunsan National University, and Convergence Plasma Research Center, NFRI, Korea

- P19 Highly stable schottky cells using cluster-free a-Si:H deposited by multi-hollow discharge plasma CVD method
K. Hatozaki, K. Nakahara, G. Uchida, H. Seo, N. Itagaki,
K. Koga and M. Shiratani
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- P20 On the behavior of metastable argon atom density in high density Ar discharge
Min Park, Min Park¹ and Hong-Young Chang¹, Shin-Jae You², Jung-Hyung Kim² and Yong-Hyeon Shin²
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- P21 Flowing Liquid Treatment by Microwave Plasma
Koji Kanetake, Tatsuo Ishijima and Hirotaka Toyoda
Nagoya University, Japan
- P22 BREAKDOWN ELECTRON TEMPERATURE IN LIQUID-IMMERSED ELECTRODES BY HIGH VOLTAGE PULSES
Yong Seong Byeon, Ki Baek Song, Young June Hong, Guangsupo Cho, Duk In Choi, and Eun Ha Choi
Department of Electrophysics, Plasma Bioscience Research Center, Kwangwoon University, Korea
- P23 Decomposition of an Artificial Biogas by a Dielectric Barrier Discharge
Kazuhiro Takahashi, Muroran Institute of Technology, Japan
- P24 Gas barrier properties of SiON films deposited as a function of the plasma process parameters at low temperature by PECVD
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- P25 Recovery of plasma-damaged GaN by atomic nitrogen and hydrogen
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- P26 The influence of plasma parameters on the TCO film growth mechanism in magnetron sputtering
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- P27 High performance and Reaction Mechanism for Decomposition and Fixation of Dry Etching exhaust Perfluoro-Compound Gases
Kei Hattori^{1, 2}, Makoto Sekine² and Masaru Hori²
¹Toshiba Corp., and ²Nagoya University, Japan
- P28 Synergy effect on photo-catalytic activity of ZnO powder consequential O₂ plasma treatment
Won Suk Jung¹, Sang-Hun Nam¹, Sang-JinCho¹, Hee Su Yang¹, Youn Jea Kim² and Jin-Hyo Boo¹
Sungkyunkwan University, Korea
- P29 Physical property and synthesis of ZnO-TiO₂ core shell powder by sol-gel method
Hee Su Yang¹, Sang-Hun Nam¹, Sang-JinCho¹, Won Suk Jung¹, Youn Jea Kim² and Jin-Hyo Boo¹
Sungkyunkwan University, Korea

18:30 Closing Remark

Farewell Dinner & Joint discussion on promotion of Applied Plasma Science and Engineering in Asia : Education and next topical workshop in Asian country, etc.