



The Nanobubble 2024

(The 533rd Symposium on Sustainable Humanosphere)

Wednesday, October 9 - Saturday, October 12,
2024 Obaku Plaza, Uji Campus, Kyoto University

Welcome Message

I would like to express our sincere gratitude for your continued support. We are deeply appreciative of your understanding and cooperation in relation to this conference.

The Nanobubble International Conference has been held almost every two years, starting with “Nanobubbles and Micropancakes 2012” at Les Houches (past conferences include: Magdeburg (Nanobubble 2022), Suzhou (Nanobubble 2018), Coffs Harbor (ACIS 2017 Symposium), and Shanghai (Nanobubble 2014)). At these international conferences, we have shared research findings based on recent advancements, particularly in the fields of nanobubbles (ultrafine bubbles) and nanodroplets. For the 2024 conference, we also aim to address the latest trends in the areas of fine bubbles and ultrafine bubbles.

This will include the presentation of the latest experimental data and observed phenomena, new theoretical insights and models, advanced nano-characterization techniques, and cutting-edge research related to fine bubbles in fields as diverse as biology, environmental protection, restoration, and medicine.

In addition, the conference will also be held jointly as “The 533rd Symposium on Sustainable Humanosphere.” In 2024, the event will be hosted by the Kyoto University Fine Bubble Research Group and will take place at Obaku Plaza on Kyoto University’s Uji Campus.

We anticipate this academic meeting will foster active discussion and exchange not only among researchers from Japan and abroad but also with industry professionals. We kindly ask for your understanding and support for the objectives of this academic meeting.

Kyoto University Fine bubble Research Group

Yoshikatsu Ueda

上田 義勝



Members

Scientific Board

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Katsuyuki Takahashi (Iwate University)
Lijuan Zhang (Shanghai Advanced Research Institute, CAS)
Naoto Nihei (Fukushima University)
Pan Li (Tongji University)
Shoichiro Hamamoto (Hokkaido University)
Takashi Goshima (Kagoshima University)
Takehiko Sato (Tohoku University)
Tetsuji Okuda (Ryukoku University)
Wen Zhang (New Jersey Institute of Technology)

The Union of Fine Bubble Scientists and Engineers

Keynote Speakers

Prof. Dr. Claus-Dieter Ohl

Department for Soft Matter Physics, Faculty of Natural Sciences, Otto-von-Guericke University Magdeburg, Germany

Professor Claus-Dieter Ohl has started his education into bubbles in Göttingen with the late Professor Werner Lauterborn. In 1999 he joined as a postdoc with Professor Andrea Prosperetti at Johns Hopkins University followed by Professor Detlef Lohse at the University of Twente. In 2005 he became VIDI fellow in Twente and started the research group “Jetting into cells”. In 2007 Prof. Ohl became Assistant Professor and in 2012 Associate Professor at the Nanyang Technological University. His research interest includes high-speed fluid mechanics, acoustics, nanobubbles, nucleation phenomena, boiling, and medical applications of cavitation. Since 2017 he joined as full Professor the Otto-von-Guericke University in Magdeburg where research into large empty bubbles started many centuries ago.



Prof. Dr. Koichi Terasaka

Department of Applied Chemistry, Faculty of Science and Technology, Keio University, Japan

Koichi Terasaka was born in 1961 in Akashi, Japan. In 1991 he received his Doctor of Engineering degree from the Keio University Graduate School of Engineering. Since 2008, he has been a full Professor in the Chemical Engineering Laboratory, Department of Applied Chemistry, Faculty of Science and Technology, Keio University. He was a Visiting Professor at the Technical University of Braunschweig, Germany in 1995, the Hamburg University of Technology, Germany in 2016, and a Mercator Fellow of DFG since 2017. In 2017, he served as a Visiting Professor at Dalhousie University in Canada. His original professionality was bubble column design, but since 2001 he has been engaged in research on Fine Bubbles and Ultra-fine Bubbles, elucidating the principles of fine bubble generation, conducting practical research, and developing evaluation technology. He founded the Fine Bubble Industries Association (FBIA) in 2011 and the Union of Fine Bubble Scientists and Engineers (FBU) in 2015. He serves as an ISO/TC281 committee member since 2013. In 2018, he established the International Fine Bubble Consortium with three universities in Japan, Germany, and Canada.



Prof. Dr. Agata A. Exner

Departments of Radiology and Biomedical Engineering, Case Western Reserve University School of Medicine, Cleveland Ohio, USA.



Dr. Exner is the Henry Willson Payne Professor and Vice Chair for Basic Research in the Department of Radiology, and Professor of Biomedical Engineering at Case Western Reserve University School of Medicine in Cleveland, Ohio. She also holds an adjunct appointment in the Department of Physics at Toronto Metropolitan University. Her group's research is at the interface of nanomedicine and biomedical ultrasound and focuses on development of novel platform technologies for molecular imaging and image-guided drug delivery. Under this umbrella her lab has pioneered the development of long-circulating ultrasound responsive targeted nanobubbles for biomedical applications. The nanobubbles are a versatile platform with potential use as cancer cell specific agents for early disease diagnosis, as companion diagnostics for prediction of tumor heterogeneity and vascular permeability and as cell specific cavitation agents for ultrasound-mediated therapy. She is also an expert in long acting, intratumoral drug delivery formulations. Her research has been continuously funded by the NIH for over 19 years. Dr. Exner is an elected Fellow of the American Institute for Medical and Biological Engineering, and Distinguished Investigator of the Academy of Radiology Research. At CWRU, Dr. Exner is also the Director of the Case Center for Imaging Research, Associate Director of the Case Medical Scientist Training Program, and a co-leader of the Comprehensive Cancer Center Cancer Imaging Program.

Prof. Dr. Wen Zhang

New Jersey Institute of Technology, USA



Wen Zhang is a professor of NJIT's Newark College of Engineering in the Department of Civil and Environmental Engineering with a second appointment in the Department of Chemical and Material Engineering. Wen is a licensed Professional Engineer (P.E.) registered in the States of New Jersey and Delaware. He is an American Academy of Environmental Engineers and Scientists (AAEES) Board Certified Environmental Engineer (BCEE). He has a broad spectrum of research interests and footprints in colloidal science and interfaces, nanomaterial synthesis and characterization, catalytic processes and engineering that translate to vibrant scientific research and technology transfer activities. The laboratory conducts extensive research into the interfacial processes (e.g., adsorption, reactions, aggregation and dissolution) of various materials, such as nanomaterials, microplastics, microbes, and bubbles. Additionally,

they explore reactive membrane filtration systems for resource recovery, desalination and contaminant removal.

Prof. Dr. Jun Hu

College of Sciences, Shanghai University, Shanghai 200444, P. R., China.

Graduated from University of Science and Technology of China in 1986, got Master degree on Nuclear Physics in Shanghai Institute of Nuclear Research (SINR), Chinese Academy of Sciences (CAS) in 1989 and PhD on Biophysics in Fudan University in 1999. A senior scientist in Advanced Research Institute (SARI) and Shanghai Institute of Applied Physics (SINAP), CAS from 1999-2023. Now a professor in the College of Sciences in Shanghai University.

Research area focused on advanced imaging technologies (such as scanning probe microscopy (SPM) and synchrotron) and their applications in physics and biology. Recent interests including nanobubbles and human brain imaging.



Invited Speakers

Prof. Dr. Keita Ando

Department of Mechanical Engineering, Faculty of Science and Technology, Keio University, Japan

Dr. Keita Ando is an associate professor in the Department of Mechanical Engineering at Keio University. After his undergraduate study in mechanical engineering at Keio University, he began to study cavitation and bubble dynamics at California Institute of Technology (Caltech) and performed theoretical and simulation study on shock propagation in dispersed bubble flow, obtaining a Ph.D. degree in 2010. For his postdoctoral study at Nanyang

Technological University (NTU) in 2011, he performed experimental study on bubble nucleation in small-scale underwater explosion, which allows for predicting cavitation inception pressure with the aid of numerical simulation. Currently, in his research group at Keio, he studies acoustic cavitation in the context of cleaning and medical applications.



Prof. Dr. Yoshihisa Harada

Institute for Solid State Physics, The University of Tokyo, Japan

Prof. Harada graduated from the University of Tokyo and got a Ph.D. degree in 2000 under the supervision of Prof. Shik Shin. He worked at RIKEN/SPring-8 as a postdoctoral researcher until 2007. He was appointed as project lecturer and project associate professor until 2011 at the University of Tokyo. He became Associate Professor at Institute for Solid State Physics, the University of Tokyo in 2011 and was promoted to Professor in 2018.

He advanced soft X-ray emission spectroscopy using synchrotron radiation to study various targets, including pure liquid water and interfacial water. In 2008, his group reported the inhomogeneity of liquid water, which stimulated various discussion and still remains a hot topic in water-related research. This powerful technique opens up new research possibilities also in the water-air interface, which includes nanobubbles and nanodroplets.



Prof. Dr. Samir Kumar Khanal

Environmental Engineering at the University of Hawaii at Manoa (UHM), USA



Prof. Samir Kumar Khanal is a Professor of Environmental Engineering at the University of Hawaii at Manoa (UHM) and an Affiliate faculty at Korea University. He began his tenure-track position at UHM in 2008. Prior to UHM, he served as a Post-doctoral Research Associate and Research Assistant Professor at Iowa State University. He holds a BS in Civil Engineering from Malaviya National Institute of Technology, an MS in Environmental Engineering from the Asian Institute of Technology, and a PhD in Environmental Engineering from the Hong Kong University of Science and Technology. Prof. Khanal is renowned for his work in anaerobic digestion, nanobubble technology, aquaponics, and waste-to-resources. He has supervised numerous students and post-docs and has 159 refereed publications, 17 book chapters, and 11 books to his name. His research has earned him multiple awards, including the University of Hawaii's Board of Regents Medal for Excellence in Research and the Elsevier Impactful Research Award. Prof. Khanal is also an editor-in-chief of Bioresource Technology and is ranked among the top environmental scientists globally.

Prof. Dr. Niall English

School of Chemical and Bioprocess Engineering, UK



Niall English is an inventor and professor in Chemical Engineering at UCD. He is a specialist on electric-field effects on materials, gases and liquids, including in inventions and technology commercialisation. He has recently been awarded an ERC-Advanced Grant on nanobubble lifetime and population engineering to further water treatment and carbon capture, as well as two EIC-Accelerator grants in both of his spin-outs.

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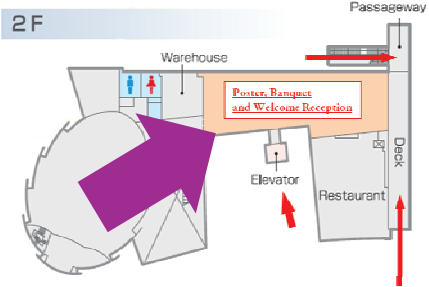
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Schedule

Oct. 9, Nanobubble2024 Schedule

Registration : Oct. 9 15:00 - 17:00, Oct. 10 9:00 - 10:00

Oct. 9	Hybrid space (2F, Obaku Plaza)
15:00	 <p>Registration at Hybrid Space (2F)</p>
17:00	Welcome Reception

Oct. 10, Nanobubble2024 Schedule

Oct. 10	Kihada Hall		Room 1		
10:00	Opening Remarks: Mamoru Yamamoto, Director of the Research Institute for Sustainable Humanosphere, Kyoto University				
10:10	Chair: Koichi Terasaka	Keynote (Prof. Dr. Wen Zhang) Nanobubbles and their Environmental and Agricultural Applications	Page 14		
10:55		Invited I (Prof. Samir Khanal) Nanobubble Applications in Environmental Remediation and Agriculture : Challenges and Opportunities	Page 16		
11:25	Breaks (Coffee Break) <i>(No food or drinks allowed in Kihada Hall)</i>		Breaks (Coffee Break)		
11:40	Chair: Lijuan Zhang	Ty Shitanaka*, Kyle R. Marcelino, Manpreet Kaur, K.C. Surendra, Samir K. Khanal , Department of Molecular Biosciences & Bioengineering, University of Hawaii at Manoa,Nanobubble Technology Can Improve Mass Transfer Of Co2 For Algal Cultivation,AB00047	Page 17	Anto Tri Sugiarto*, Hilman Syaeful Alam, Anggrarini Permanawati S and Yohanes Aris Purwanto , Research Centre for Smart Mechatronics, National Research and Innovation Agency,Development Of Plasma Activated Fine Bubble Water System And Its Application In Agriculture,AB00062	Page 43
11:55		Shreeja Lopchan Lama, Kyle Rafael Marcelino, K.C. Surendra, Samir K. Khanal* , Department of Civil, Environmental and Construction Engineering, University of Hawai'i at Mānoa,Application Of Nanobubbles And Biochar In Aquaponics: Effects On Plant Yield And Water Quality,AB00051	Page 19	Riku Miyazaki, Yasuyuki Kimura and Yuki Uematsu* , Department of Physics and Information Technology, Kyushu Institute of Technology,Nanobubble-Assisted Formation Of Non-Gaseous Nanoparticles In Water,AB00011	Page 45
12:10		Kyle Rafael Marcelino, Sumeth Wongkiew, Ty Shitanaka, K. C. Surendra, Bongkeun Song and Samir Khanal* , Department of Civil, Environmental, and Construction Engineering, University of Hawai'i at Mānoa,Nanobubble Technology-Integrated Aquaponic Systems Enhances Plant Yields And Nitrification,AB00048	Page 21	Miha Jelenčić, Uroš Orthaber, Jaka Mur and Rok Petkovšek* , University of Ljubljana, Faculty of Mechanical Engineering,Laser-Induced Nanobubbles On Gold Nanoparticles As A Model For Nanobubbles Occurring On Natural Impurities In Water,AB00024	Page 46
12:25	Lunch time <i>(No food or drinks allowed in Kihada Hall)</i>		Chair: Julie Y. Chen	Lunch time Seminar: 13:00 - 13:15 Purenanotech 13:15 - 13:30 OK Engineering 	
14:00	Chair: Jun Hu	Keynote (Prof. Dr. Agata A. Exner) Big Impact of Tiny Bubbles: Emerging Biomedical Applications of Shell-Stabilized Nanobubbles	Page 24		
14:45		Invited (Prof. Keita Ando) Ultrasonic cleaning with gas-supersaturated water: Possible role of nanobubbles as cavitation nuclei	Page 25		

Oct. 10, Nanobubble2024 Schedule

Oct. 10	Kihada Hall			Room 1		
15:15	Breaks (Coffee Break) <i>(No food or drinks allowed in Kihada Hall)</i>			Breaks (Coffee Break)		
15:30	Chair: Stephen D. Evans	Cynthia Tchouta Klas Meyer Kristin Hecht Gunter Weißbach , Federal Institute for Materials Research and Testing,Automated Nanobubble Generation System: Characterization And Potential Applications In The Chemical Industry,AB00059	Page 26	Chair: Anto Tri Sugianto	Yatha Sharma*, Claus-Dieter Ohl and Juan Manuel Rosselló , Institute of Physics, Soft Matter Department, Otto-von-Guericke-University,Nanobubble Generation From Laser-Illuminated Nanoparticles,AB00041	Page 49
15:45		Minoru Tanigaki*, Kiyohito Takeshita, Daiju Hayashi, Takuya Yamakura,Yoshikatsu Ueda, Akihito Taniguchi, Yomei Tokuda, Yoshitaka Ohkubo , Institute for Integrated Radiation and Nuclear Science, Kyoto University,Studies On Ultrafine Bubbles Using Radioactive Nuclei As Probes,AB00055	Page 27		Takehiko Sato*, Shigeru Fujimura, Seiji Kanazawa, Siwei Liu, Tomoki Nakajima and Yunchen Xiao , Institute of Fluid Science, Tohoku University,Generation Of High-Speed Nanodroplets And The Cleaning Effect,AB00033	Page 51
16:00		Jean Grejoy Andrews, Sunaina, Tatek Temesgen, Peter Kusalik, Kelly Rees, Russ Algar, Susana Y. Kimura* , Department of Chemistry, University of Calgary,High-Precision Acoustic Velocimeter For Nanobubble Characterization,AB00030	Page 29		Harsh Sharma, Neelkanth Nirmalkar* and Wen Zhang , Department of Chemical Engineering, Indian Institute of Technology Ropar,Nanobubbles Produced By Membrane Nanopores To Probe Gas-Liquid Mass Transfer Characteristics,AB00034	Page 53
16:15	Chair: Ing Shouh Hwang	Marin Šako, Roland Netz, Matej Kanduč* , Jožef Stefan Institute,The Impact Of Hydrophobic Impurities On Water'S Stability Against Cavitation,AB00039	Page 30	Chair: Fang Yang	Sining Zhou, Min Liu, Yongsen Shi, Yanyan Jia, Lianpeng Sun and Hui Lu* , Guangdong Provincial Key Laboratory of Environmental Pollution Control and Remediation Technology (Sun Yat-sen University),Enhancing Anaerobic Digestion Performance Of Oxytetracycline-Laden Wastewater Through Micro-Nano Bubble Ozonation Pretreatment,AB00054	Page 55
16:30		Hendrik Reese*, Patricia Pfeiffer, Ulisses J. Gutiérrez-Hernández, Pedro A. Quinto-Su and Claus-Dieter Ohl , Department Soft Matter, Institute of Physics, Otto-von-Guericke-University,Cavitation Bubble Patterns From Elastic Surface Waves,AB00010	Page 31		Lan Tang, Sining Zhou, Fan Li, Lianpeng Sun and Hui Lu* , Guangdong Provincial Key Laboratory of Environmental Pollution Control and Remediation Technology (Sun Yat-sen University),Ozone Micro-Nano Bubble-Enhanced Selective Degradation Of Oxytetracycline From Production Wastewater: The Overlooked Singlet Oxygen Oxidation,AB00060	Page 57
16:45		Seung-Yop Lee ,* and Han-Bok Seo , Dept. of Mechanical Engineering, Sogang University,Megasonic Generation Of High-Density Nanobubbles,AB00061	Page 33		Julie Y. Chen and Jeff Bodycomb, HORIBA,Orthogonal Measurement Of Number Concentration Standards For Nta Calibration,AB00003	Page 59
17:00	Breaks					
17:15	Chair: Samir Khanal	Yuki Mizuno, Yuta Yamamoto, Tsuyoshi Yamaguchi and Keiji Yasuda* , Department of Chemical Systems Engineering, Graduate School of Engineering, Nagoya University,Effects Of Surfactants And Nanobubbles On Morphology Of Au-Pt Core-Shell Nanoparticles Synthesized By Sonochemical And Chemical Reduction,AB00027	Page 35	Chair: Niall J. English	Tao Liu* , School of Water, Energy and Environment, Cranfield University,Nanobubble Technology-Triggered Innovation In Water And Wastewater Treatment,AB00037	Page 61
17:30		T. Itagaki, H. Narita, H. Hasegawa, T. Kanbayashi And S. Uemura, Graduate School Of Utsunomiya University,Effect Of Microbubble Bathing On Human Sleep,AB00040	Page 37		Priya Koundle, Neelkanth Nirmalkar* and Grzegorz Boczkaj* , Department of Chemical Engineering, Indian Institute of Technology Ropar,Ozone Nanobubble Technology As A Novel Aops For Pollutants Degradation Under High Salinity Conditions,AB00069	Page 63
17:45		Karol* Ulatowski , Patryk Szczygielski and Paweł Sobieszuk* , Warsaw University of Technology, Faculty of Chemical and Process Engineering, Department of Biotechnology and Bioprocess Engineering,Determination Of Cleaning Potential Of Microbubble Dispersions Of Various Gases In Waters Of Different Purity,AB00004	Page 39		Hao Xiong and Fang Yang, Preparation of biomembrane shelled nanobubbles, AB00072	Page 65
18:00		Nachael Mwanga, Xitong Wang, Pan Li* , State Key Laboratory of Pollution Control and Resource Reuse, Tongji University,Unveiling The Preventive Potential: Micro And Nanobubbles Influence On Membrane Fouling During Drinking Water Treatment,AB00028	Page 41		Mengyuan Cui and Fang Yang, Oxygen dependent chemiluminescent for reactive oxygen species induced tumor inhibition, AB00073	Page 66

Oct. 11, Nanobubble2024 Schedule

Oct. 11		Kihada Hall	Room 1			
9:30	Chair: Yoshikatsu Ueda	Keynote (Prof. Dr. Koichi Terasaka) Generation, Concentration and Deparation of Ultrafine Bubbles in Water	Page 69			
5-minute break (To each room)						
10:20	Chair: Tetsuji Okuda	Alok Das and Neelkanth Nirmalkar* , Indian Institute of Technology Ropar,Interaction Between Nanobubbles And Bacteria: Impacts On Growth And Its Mechanism,AB00056	Page 77		Shin Kyo, Kenji Yamazaki and Tsutomu Uchida , Faculty of Engineering, Hokkaido University ,Liquid-Afm Observation Of Surface-Ultrafine Bubbles Formed On Hydrophobic Smooth Solid (Hopg) Surface From Methane-Hydrate Dissociated Water,AB00001	Page 101
10:35		Keiji Yasuda*, Tomoya Yasui, Tsuyoshi Yamaguchi and Nozomu Yasui , Department of Chemical Systems Engineering, Graduate School of Engineering, Nagoya University,Formation Of Hollow Polymer Particles By Fine Bubbles And Anti-Solvent Crystallization,AB00026	Page 79		Mengdi Pan*, Parisa Naeiji, Marziyeh Jannesari, Omid Saremi and Niall J. English ,Study of Clathrate Hydrate Formation in Contact with CO2 Bulk Nanobubbles:Paths Towards Industrial Water Treatment,AB00018	Page 103
10:50		Sunaho Kawakami, Takahiro Hisaki, Yuji Fujita, Tsuyoshi Kiriishi, Takahito Imai, Kin-ya Tomizaki and Masayuki Yamasaki* , Ryukoku university, Department of Food Science and Human Nutrition,Properties Of Ultrafine-Bubbles And Its Application To Cooking,AB00008	Page 81		Ryota Saito, Qin-Yi Li,* Tatsuya Ikuta and Koji Takahashi , Kyushu University,3D Microscopy Reveals Complex Deformation Of Nanobubbles Confined In Nanotubes,AB00057	Page 105
11:05		Damien V. B. Batchelor, Anjali Lad, Kathryn Burr, Kristian Hollingsworth, Steven Freear, W. Bruce Turnbull, Jonathon A. T. Sandoe and Stephen D. Evans* , School of Physics and Astronomy, University of Leeds,Freeze-Drying And Optical Characterization Of Lipid Shell Nanobubbles,AB00032	Page 83	Ryuto Ohashi, Hideaki Teshima, Mikito Ueda and Hisayoshi Matsushima* , A Faculty of Engineering, Hokkaido University,High Speed Afm Observation Of Electrolytic Nanobubbles Formation And Dissolution Process On Hopg,AB00005	Page 107	
11:20	Breaks (Coffee Break) <i>(No food or drinks allowed in <u>Kihada Hall</u>)</i>		Breaks (Coffee Break)			
11:35	Chair: Keiji Yasuda	Gaurav Yadav, Neelkanth Nirmalkar* and Claus-Dieter Ohl , Indian Institute of Technology Ropar,Electrochemically Reactive Nanobubbles By Water Electrolysis,AB00031	Page 85	Jackowetz, J.N.,Kozak, P.A., Hanson, C.S., Tsoukalas, K.D., Villanueva, C.A. , Hydrosome Labs,Unveiling A Hidden Population: Sub-50 Nm Ultrafine Bubbles Revealed By Liquid Cell Tem And Their Potential Applications,AB00016	Page 109	
11:50		Thi Thuy Bui, Viet-Anh Nguyen*, Trong-Bang Le , Institute of Environmental Science and Engineering, Hanoi University of Civil and Engineering,Physical Properties Of Nanobubble Under Various Operational Conditions,AB00067	Page 87	Fankai Peng*, Ahmad Jabbarzadeh* , School of Aerospace, Mechanical and Mechatronic Engineering, Faculty of Engineering and Information Technology, The University of Sydney,Modelling Bulk Nanobubbles Of Nitrogen, Oxygen, And Air In Water By Molecular Simulations,AB00038	Page 111	
12:05		J. M. D. Coey,*Anup Kumar, Sruthy Poulouse and Plamen Stamenov , 1 School of Physics and CRANN, Trinity College, Dublin,Nanobubbles In Hard Water,AB00019	Page 89	Hamidreza Hassanloo*, Xinyan Wang , Centre for Advanced Powertrain and Fuels, Brunel University London,Unraveling Nanobubble Formation, Stability, And Effects On Host Liquid Inherent Properties: Insights From Molecular Dynamics Approaches,AB00015	Page 113	
12:20	Lunch time <i>(No food or drinks allowed in <u>Kihada Hall</u>)</i>		Lunch time			
13:45	Chair: Wen Zhang	Keynote (Prof. Dr. Claus-Dieter Ohl) Not so stable bulk nanobubbles, what can we do with them?	Page 92			
14:30		Invited II (Prof. Yoshihisa Harada) Inversion Dynamics of Nanoscale Gas-Water Interfaces	Page 93			
15:00	Breaks (Coffee Break) <i>(No food or drinks allowed in <u>Kihada Hall</u>)</i>		Breaks (Coffee Break)			

Oct. 11, Nanobubble2024 Schedule

Oct. 11	Kihada Hall		Room 1			
15:15	Chair: Neelkanth Nirmalkar	Takeshi Ohdaira, Emi Kitakata , Institute for Solid State Physics, The University of Tokyo, Targeting Effects Of Positively Charged Micro-Nanobubbles Water On Both Gastrointestinal Cancer Cells And Coagulation That Interfere With The Microscopic Vision: Potential To Prevent Recurrence After Surgery And To Acquire Clear Endoscopic Vision, AB00020	Page 95	Chair: Tsutomu Uchida	Yasutaka Yamaguchi , Dept. Mechanical Eng., Osaka Univ., Mechanical And Thermodynamic Analysis Of Wetting And Liquid-Related Interfaces By Molecular Dynamics, AB00066	Page 116
15:30		Pinunta Nittayacharn*, Salima El Yakhlifi, Laura Chen, Jean Eastman, Mitchell Drumm and Agata A. Exner , Departments of Radiology, Case Western Reserve University, Optimizing Cationic Nanobubble Formulations For Enhanced In-Vitro Acoustic Performance, Cellular Uptake, And Transfection Efficiency, AB00029	Page 96		Tetsuji Okuda, Aina Sakaguchi, Takahiro Fujioka, Satoshi Nakai, Wataru Nishijima , Ecology and Environmental Engineering Course, Faculty of Advanced Science & Technology, Ryukoku Univ., Membrane Cleaning Improvement Using Physical Function Of Ufb, AB00064	Page 118
15:45		Viafara-Garcia SM*, Acevedo Juan Pablo, Juan Luis Palma, Esteban Landaeta, Javier Rojas, Juan Francisco Fuentealba , Cell for cells, Optimizing Oxygen Delivery In Tissue Engineering: Integrating Micro/Nano Bubbles And Droplets Into Photocrosslinkable Scaffolds, AB00045	Page 98		Heyun Du* , Center for Sustainability and Energy Technologies, Chang Gung University, Investigation Of 2D Materials As Electrochemical Catalyst Using Scanning Electrochemical Microscopy, AB00007	Page 120
16:00		Lijuan Zhang, The In-situ Formation and Evolution of Perfluorocarbon Nanobubbles in Microdroplets Induced by Soft X-ray, AB00071	Page 99		Ing-Shouh Hwang*, Wei-Hao Hsu, Chih-Wen Yang, Chung-Kai Fang and Ching-Hsiu Chen , Institute of Physics, Academia Sinica, Different Perspectives On The Nature Of Surface Nanobubbles And Bulk Nanobubbles, AB00021	Page 121
16:15 - 17:45	Poster Session (2F Hybrid Space)					
18:00	Banquet (2F Hybrid Space)					

Oct. 12, Nanobubble2024 Schedule

Oct. 12	Kihada Hall		Room 1		
9:30	Chair: Agata Exner	Keynote (Prof. Dr. Jun Hu) Gas-liquid Interfaces of Nanobubbles in Bulk Water Solution: Unique Properties & Applications	Page 124		
10:15		Niall J. English*, School of Chemical and Bioprocess Engineering, University College Dublin, Nanobubble Engineering Of Low-Energy Aeration For Water Treatment, AB00043	Page 126		
10:45	Breaks (Coffee Break) <i>(No food or drinks allowed in Kihada Hall!)</i>		Breaks (Coffee Break)		
11:00	Chair: Pan Li	Shivi Garg and Dr. Neelkanth Nirmalkar , Department of Chemical Engineering, IIT Ropar, Enhancing Co2 Utilisation Process Using The Novel Technique Of Nanobubbles, AB00050	Page 129		Aakriti Sharma and Neelkanth Nirmalkar* , Indian Institute of Technology Ropar, Effect Of Nanobubbles Of Different Gases Over The Antisolvent Crystallization Of Glycine Using Ethanol As An Antisolvent., AB00012
11:15		Sritay Mistry*, Xinyan Wang , Brunel University London, Hydrogen Nanobubbles In Ammonia, AB00023	Page 131	Abinash Biswal*, Suraj P. Sharma, Hua Zhao and Xinyan Wang , College of Engineering, Design and Physical Sciences, Brunel University, Bulk Nanobubble Generation In Gasoline Fuel: Investigating Its Impact On Spray Characterization, AB00014	Page 138
11:30		Justin Chun-Te Lin* and Chung-Yi Lin , Department of Environmental Engineering and Science, Feng Chia University, Co2 Nanobubble As A Carbon Utilization Approach From Seawater Brine Mining, AB00046	Page 133	Fang Yang*, Xiao Wang, Tiandong Chen and Jian Tang, Nanobubble drug delivery system, AB00070	Page 140
11:45		Shiv Shankar Sangaru, Afnan Mashat, Hussain Shateeb, Mustafa Alsaffar, Niall J. English, Naif A Alabdullatif, Naif Almalki and Amr Abdel-Fattah* , EXPEC ARC, Reservoir Engineering Technology Division, Saudi Aramco, Large-Scale Co2-Nanobubble Utilization For Improving Biomass Productivity In Marine Micro-Algal Cultivation, AB00025	Page 134	Yan Chen* and Fang Yang, Preparation and biomedical application of fluorescent nanobubbles, AB00074	Page 142
12:00	Closing and Lunch Break				
14:00	Excursion at Chazuna				

Applications I (Medical, Agricultural and Industry)
Applications II (Medical, Agricultural and Industry)
Microbubble Research
Fundamentals and Measurement
Fundamentals and Measurement II
Fundamentals and Measurement III
Measurement, Surface and Molecular Motion
Environmental use (Membranes, Ozone)
Environmental use II (Hydrates & Membranes)
Nanodroplet, Plasma, Lasers

Nanobubble2024 Schedule

Poster Session

Core Time: Oct 11, 16:15 - 17:45

<i>ID</i>	<i>Name</i>	<i>Affiliation</i>	<i>Title</i>	<i>Page No.</i>
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Poster002 <i>AB00022</i>	Sritay Mistry*, Rohit Pillai, Xinyan Wang	Brunel University London	Small Nanobubbles Through High Frequency Vibrations	Page 146
Poster003 <i>AB00035</i>	Chung-Kai Fang, Cheng-Hao Chuang, Chih-Wen Yang, Zheng-Rong Guo, Wei-Hao Hsu, Chia-Hsin Wang and Ing-Shouh Hwang*	National Synchrotron Radiation Research Center	The Stability And Chemical Composition Of Nitrogen Gas Hydrate Overlayer On Hopg Surfaces	Page 148
Poster004 <i>AB00036</i>	Ching-Hsiu Chen, Wei-Hao Hsu and Ing-Shouh Hwang*	Institute of Physics, Academia Sinica	Can Bulk Nanobubbles Be Mesoscopic Clathrate Hydrate Structure?	Page 150
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Poster006 <i>AB00049</i>	Hideaki Teshima*, Qin-Yi Li and Koji Takahashi	International Institute for Carbon-Neutral Energy Research (WPI-I2CNER), Kyushu University	Thermal Responses Of Nanoscale Gas Phases At Graphite-Water Interfaces	Page 153
Poster007 <i>AB00063</i>	Hiroya Otagi, Yusuke Nishiuchi, Takashi Hata, Hideaki Shakutsui, Shozo Himuro, Koichi Terasaka, Kaori Tada*	National Institute of Technology, Kochi College, Department of Social Design Engineering	Effect Of Ultrafine Bubbles On The Precipitation Behavior Of Ca(OH) ₂	Page 155
Poster008 <i>AB00052</i>	Masashi Nishimoto, Yusuke Nishiuchi, Hayato Okumura, Shigenori Akamatsu, Takashi Hata*	National Institute of Technology, Kochi College, Department of Social Design Engineering	Study On Destabilization Of Ultrafine Bubbles	Page 156
Poster009 <i>AB00053</i>	Yuto YABUUCHI, Toshihiko SUGIURA*	Keio University	Effect Of Ultrafine Bubbles Near A Wall On Translational Motion Of Millibubble Clusters Under A Sound Field	Page 157
Poster010 <i>AB00058</i>	Hyang-Bok Lee*	Department of Mathematics, Physics and Computer Sciencs, Japan Women's University	Charge Of Sonoluminescing Single Bubble In Water	Page 159
Poster011 <i>AB00068</i>	Naoto Nihei* and Takamitsu Miyashita, Shoichiro Hamamoto*	Fukushima University	Effect Of Irrigation With Nanobubble Water On Crop Growth And Soil Environment In A Sorghum Field	Page 160
Poster012 <i>AB00075</i>	Shui-Shu Hsiao, Balamurugan Ananthkrishnan, Ming-Hao Hsu, Chia-Yu Hsu, Yu-Ting Chien, Hao-Yu Lo, Yong-An Chen, Hsin-Hsin Tung*	Graduate Institute of Environmental Engineering, National Taiwan University	Application of ozone fine bubbles to medical wastewater for reducing antibiotics and antibiotic resistance gene transportation and multiplication	Page 161
Poster013	Dr. Lei Wang	Research Center for Eco-environmental Sciences, Chinese Academy of Sciences	Nanobubbles Enhanced the Photodegradation of Pollutants	

Presentation Overview

Oral Presentations

Presenters at each venue (Kihada Hall, Meeting Room 1) can use a projector for their presentations. You can connect your own computer via an **HDMI** cable. Additionally, we will provide a Windows PC, allowing you to present using PowerPoint or PDF files.

Oral Presentation Times:

- **General Presentations 15min** : **10 minutes** for the presentation, followed by **5 minutes** for Q&A.
- **Invited Lectures 30min** : **25 minutes** for the presentation, followed by **5 minutes** for Q&A.
- **Keynote Lectures 45min** : **40 minutes** for the presentation, followed by **5 minutes** for Q&A.

Poster Presentations

In the poster session, you can display posters up to A0 size (841mm x 1189mm). The venue will also serve as the reception area, providing an opportunity for informal discussions while engaging with the posters.



****Lunch Information:****



Lunch boxes will be distributed (ticket system).

Eating and drinking are **prohibited** in the Kihada Hall (1st floor).

Lunch is allowed in Meeting Rooms 1 and 2. Eating and drinking are also permitted in the Hybrid Space (2nd floor)).



****Network Information:****

We will distribute papers with Wi-Fi information to those who request it.

****Lunchtime Seminar:****



10/Oct(Thu) **Room 1**

13:00 – 13:30

13:00 - 13:15 Purenanotech



13:15 – 13:30 OK Engineering



You can enjoy the seminar while eating a lunch box!

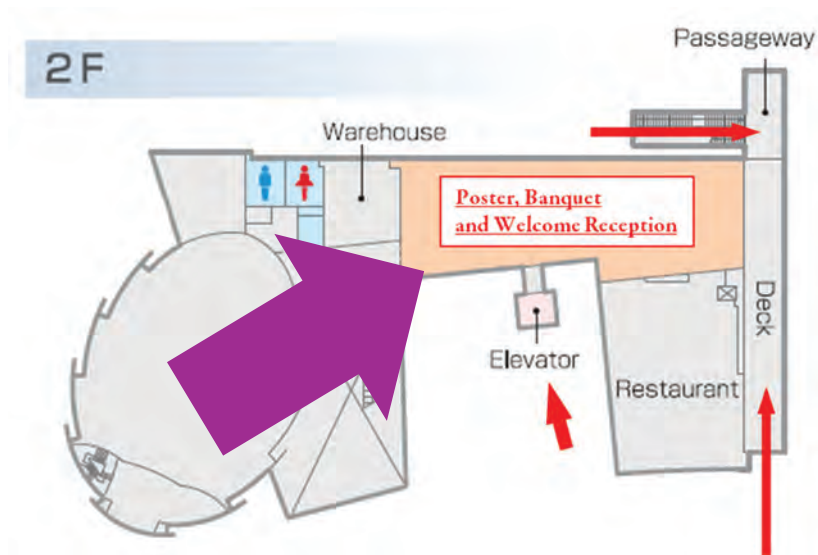
****Welcome Reception:****

9th Oct, 17:00 –

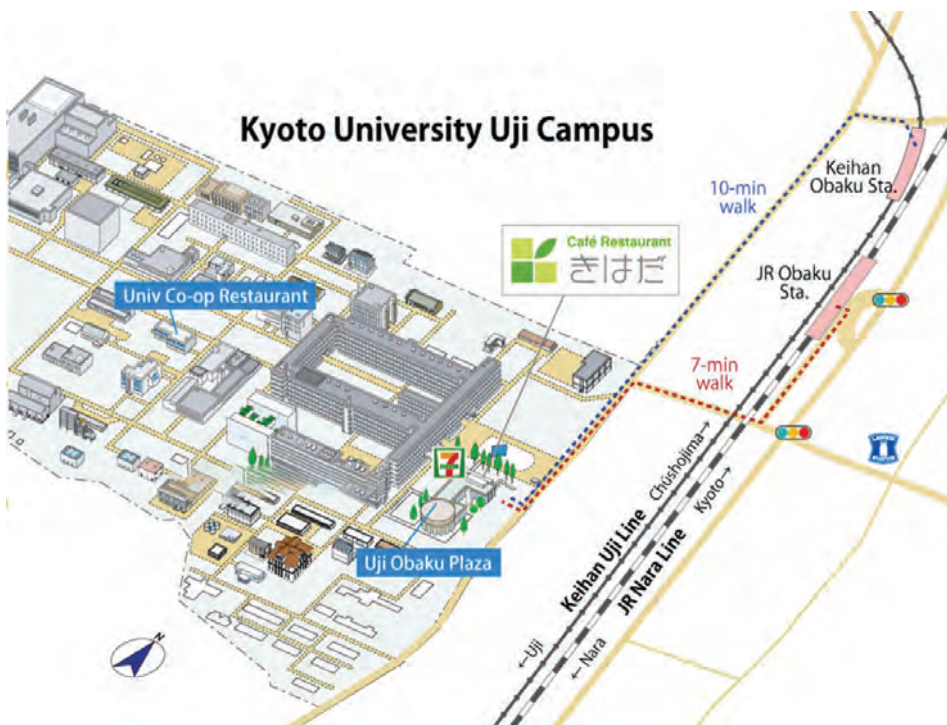
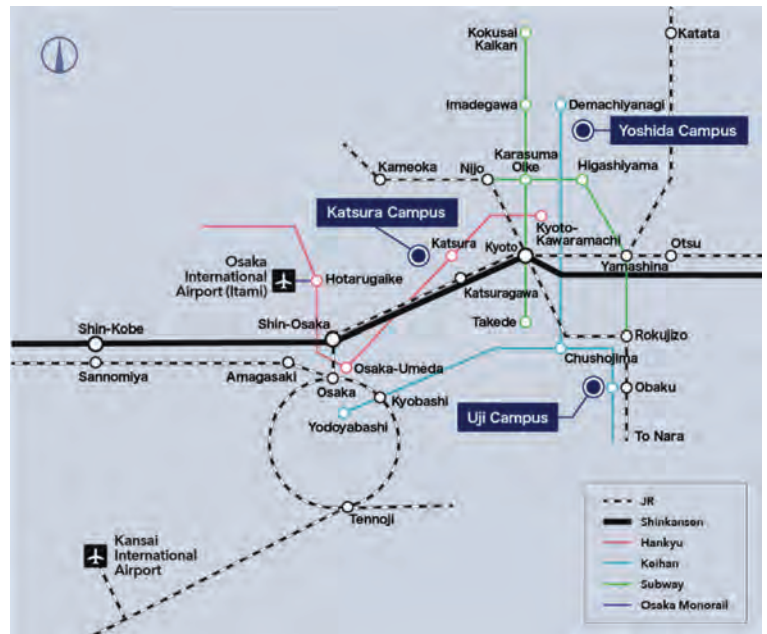
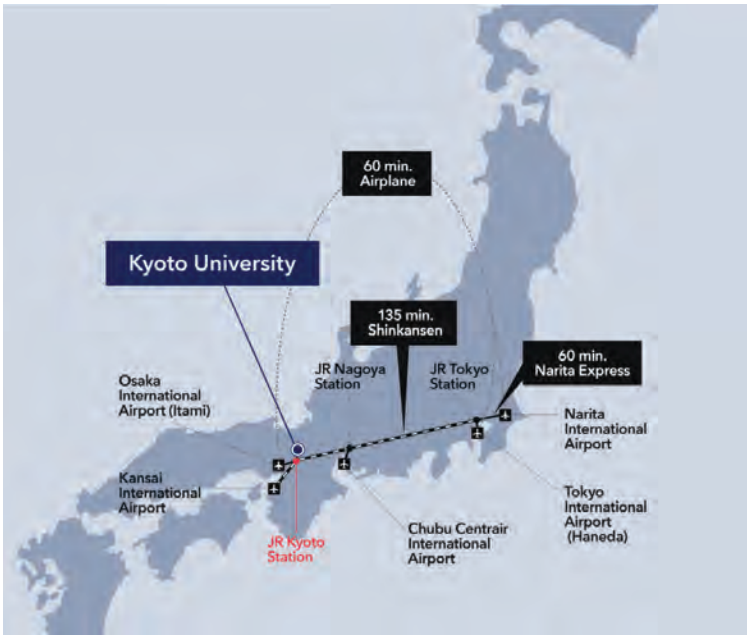
****Banquet:****

11th Oct, 18:00 –

2F Obaku Plasa, Hybrid Space

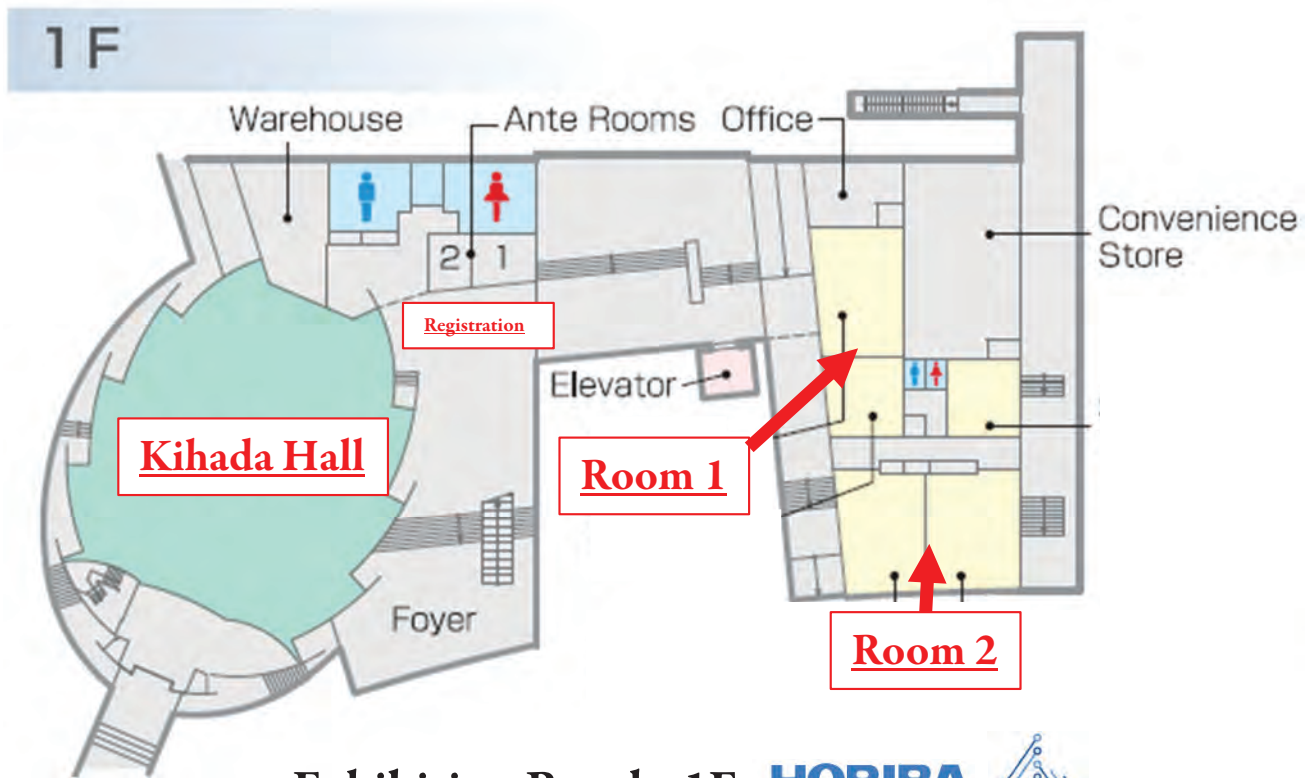


Access Map (Uji campus, Kyoto University)

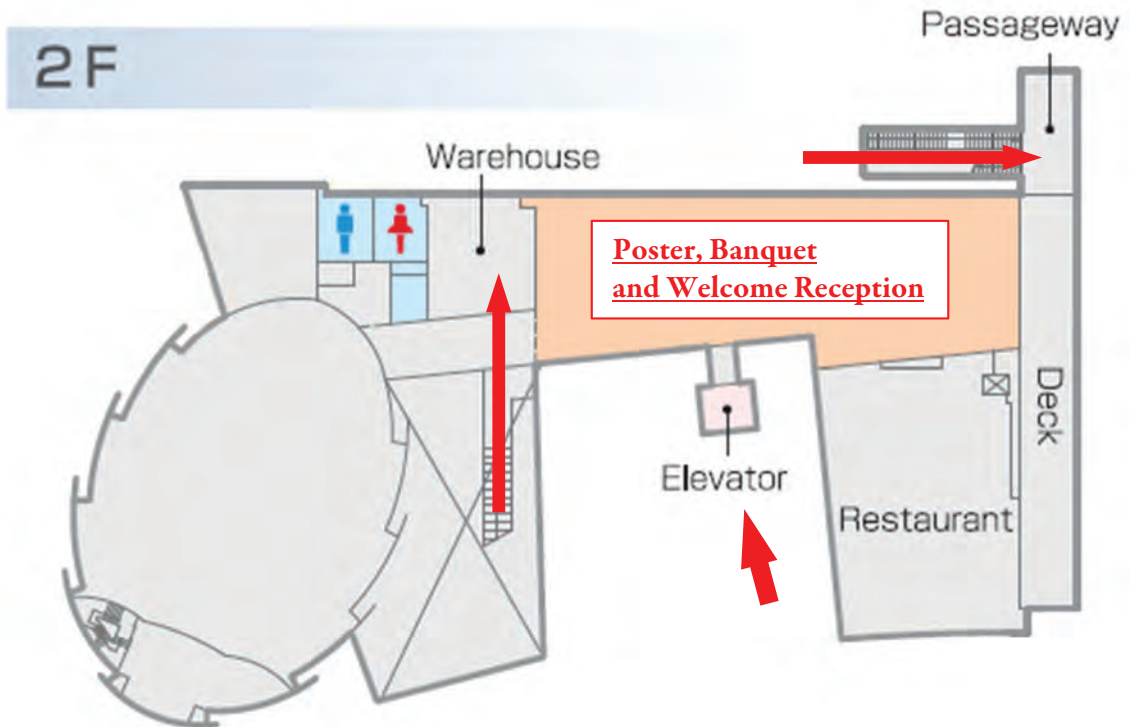


Closest Station
 JR Obaku station
 Keihan Obaku station

Obaku Plaza Map



Exhibition Booth: 1F



Exhibition Booth: 2F



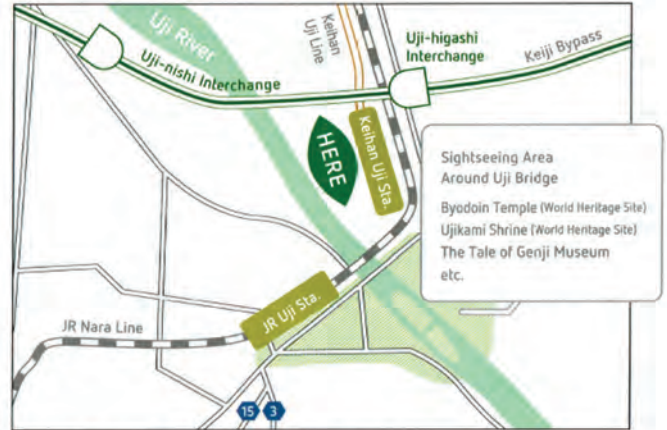
(有)OKエンジニアリング



Excursion 12th Oct, 14:00 – 17:00



<https://uji-chazuna.kyoto/en/>



About 4-minute Walk from Keihan Uji Station
 About 12-minute Walk from the South Exit of JR Uji Station
 Paid Parking Available (73 cars)



This program is supported by a subsidy from Kyoto Prefecture and Kyoto Convention & Visitors Bureau.

Participation fee: **Free**, except for transportation costs (from Keihan Obaku to Uji Station etc.).

Excursion schedule Overview

October 12 (Saturday)

12:30 - 13:15 Lunch will be provided at [the Nanobubble2024 venue](#).

13:15 Group moves together (by train: transportation costs to be covered individually).

14:00 Excursion begins at Chazuna (<https://uji-chazuna.kyoto/en/>)

14:00 - 15:00 Tea tasting experience

15:00 - Free time

- Those interested may visit the museum on the first floor (shopping etc.)
- Souvenir shopping and strolling around Uji city are also possible.
- You can leave directly after the stroll without returning to the group (please tell our staffs and please provide your answers **below**)

17:00 - End

== After the excursion, participants can depart from either *JR Uji Station* or *Keihan Uji Station* ==



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Unravel the Secrets of Nanobubbles! Generate and Characterize Ultrafine Bubbles

Generate

Unique membrane with patented coating.

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Great mass transfer effect.
Does not require high pressure.



PNT Nanobubble Generator

Characterize



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- Accurate number concentration measurement in particles/mL.
- Measurement range from 10 nm to 15 μm depending on sample.
- Determines bubble size and size distribution with precision.

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–500 to +500 mV zeta potential analysis of sample volumes as small as 100 μL .

Zeta Potential



HORIBA nanoPartica SZ-100V2 Series

Investigation of Efficient Ozone Water Production using Ozone Fine Bubble Water

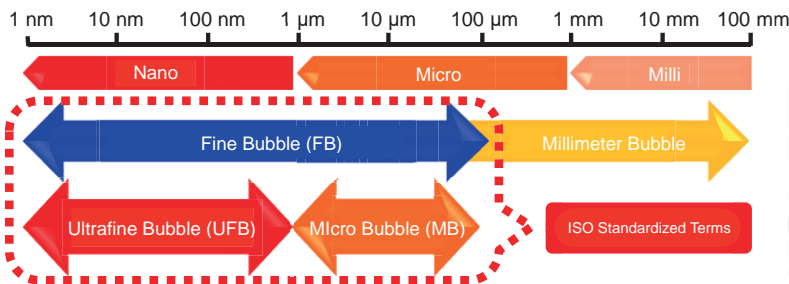


National Institute of Technology, Kochi College — Social Design Engineering (1) (2) —
OK Engineering Co., Ltd. (3)

Hiromu Kofune (1), Kaito Morishita (1), Yusuke Nishiuchi (2), Takashi Hata (2)
Daisuke Matsunaga (3), Takeshi Matsunaga (3)

Sponsored by OK Engineering Co., Ltd.

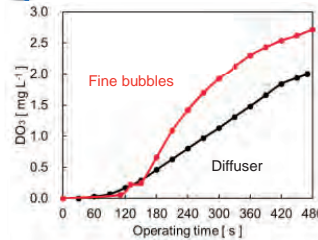
Classification of Bubbles:



- Features of Fine Bubbles:**
- Promote dissolution efficiency of the contained gas.
 - Long-term stability in solutions due to the size.
 - OH radicals are formed during collapse.

PURPOSE

Turning ozone gas into fine bubbles will certainly increase dissolution ozone efficiency of ozone, but can we produce ozone FB water more efficiently?



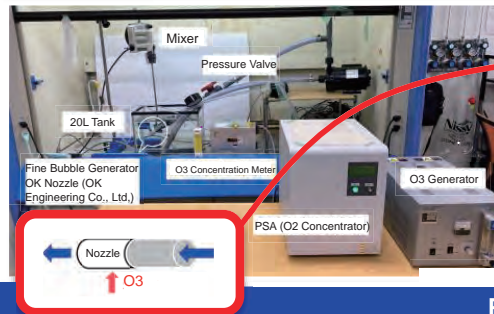
- To make the treatment of ozone exhaust simplified.

- For more versatile use!

→ Re-examine the configuration of fine bubble generator

METHODS

Re-examination of fine bubble generator's configuration



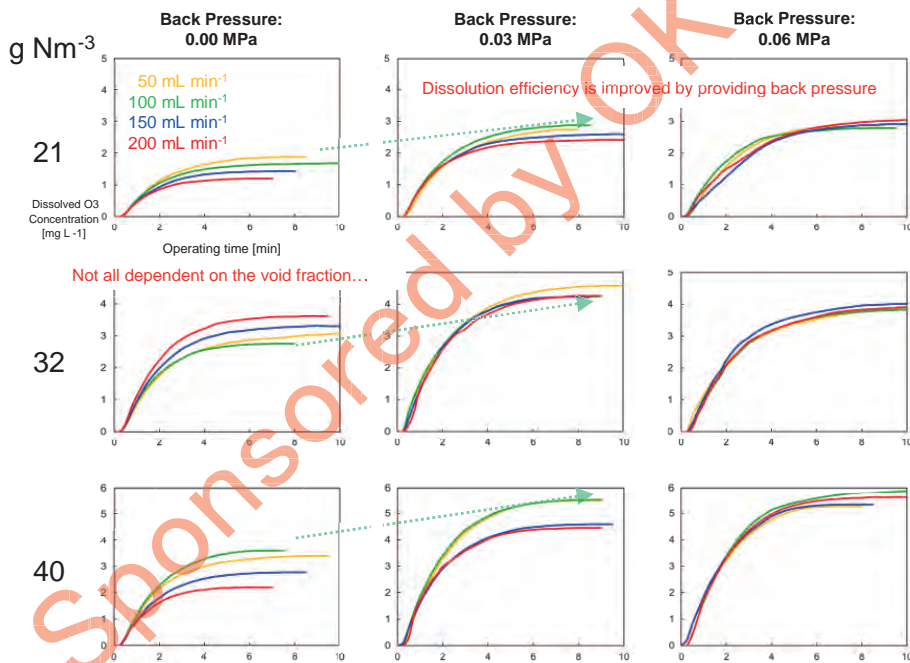
Can we increase the dissolution efficiency by installing a piping after the nozzle to provide back pressure? Simple method!

Matters for Investigation

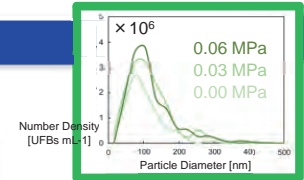
- Measure the dissolved ozone gas concentration, understand the behavior and optimize the result with:
 - Various Ozone Gas Concentration: 21 / 32 / 40 g Nm⁻³
 - Various Back Pressure: 0.00 / 0.03 / 0.06 MPa
- How does the dissolved ozone concentration decay?
- What are the advantages of ozone fine bubbles? What is the decomposition behavior of pCBA (p-Chlorobenzoic Acid) ?

UFB Particle Size Distribution

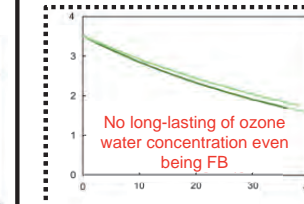
RESULTS: Efficient in Producing Ozone Water!



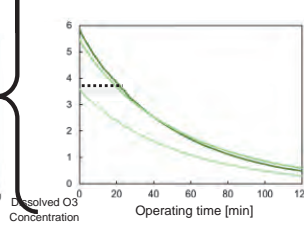
100 mL min⁻¹



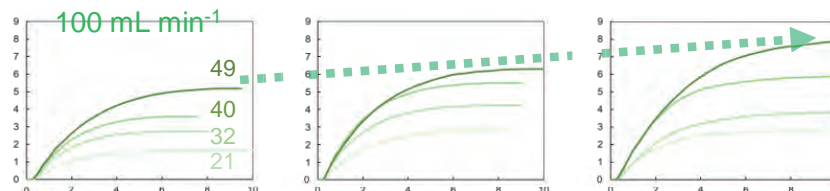
Decay Behavior:
Uniformly reduced, unaffected by back pressure.



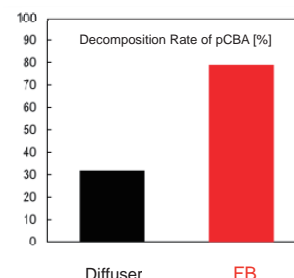
No long-lasting of ozone water concentration even being FB



Effect of Ozone Gas Concentration



The advantage of Ozone Fine bubbles should be:



The acceleration of decomposition behavior of pCBA, which is difficult to decompose by ozone alone.

→ OH radicals are generated more than the diffuser method.

*Fluorescence spectroscopy using terephthalic acid also confirmed OH radicals.

CONCLUSION

Configuration of providing a back pressure section behind the FB generator allows efficient ozone water production!



我的健康
原力水

MORE ENERGY MORE POWER



YUANLI WATER,
PROVIDING
SUPPORT
FOR YOUR
TIME OF EXERCISE

KEY TECHNOLOGY

Patent Number of
National Invention Patent :
ZL202210703854.0



The Koishio team is committed to discovering the mysteries of water. Koishio's drinking water products have been found to be healthy and safe and contain high concentrations of ultra-small nanobubbles (NANOW*).



*The study regarding the discovery of ultra-small nanobubbles was published in Scientific Reports that is published by Nature Publishing Group (Link to the article published in Scientific Reports: <https://www.nature.com/articles/s41598-023-35766-5>)

SALD-7500 ファインバブル計測システム

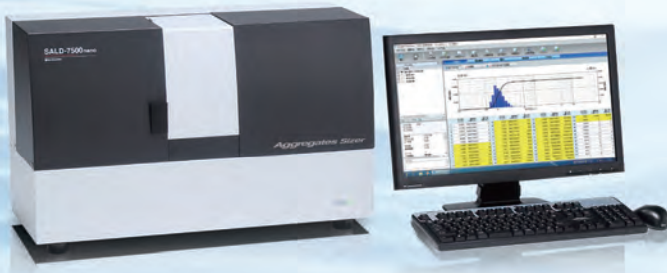
1台のシステムでウルトラファインバブルからマイクロバブルまでの定量測定に対応

qLD法（定量レーザ回折・散乱法）を採用することで、気泡径だけでなく個数濃度（個/mL）または体積濃度（ $\mu\text{L/L}$ ）を評価することが可能です。

1台の装置、2つの測定レンジで、ウルトラファインバブル（UFB）からマイクロバブル（MB）までのファインバブル全領域を定量評価することが可能です。

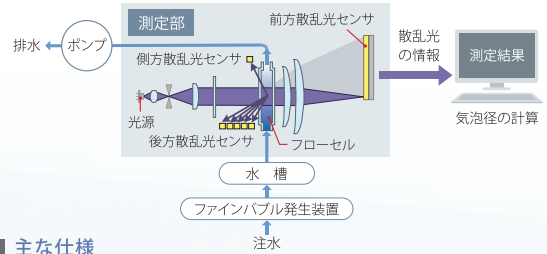
10^8 個/mLのウルトラファインバブル測定を可能にするため、従来の10倍の高感度化を実現。

ファインバブルの変化を捉えるための連続測定機能を搭載。



株式会社 島津製作所 分析計測事業部

■ マイクロバブル測定の場合



■ 主な仕様

測定範囲	UFB: 80 nm ~ 20 μm MB: 1.5 μm ~ 100 μm
個数濃度範囲	気泡径 100 nm の場合: 10^8 ~ 10^{10} 個/mL 気泡径 1 μm の場合: 10^5 ~ 10^7 個/mL 気泡径 10 μm の場合: 10^3 ~ 10^5 個/mL
UFB 測定	回分セルを使用 必要流量: 約 5 cm^3
MB 測定	フローセルを使用 最大流量: 2000 cm^3/min

「ファインバブル」、「ウルトラファインバブル」は、一般社団法人ファインバブル産業会の登録商標です。



IFB テクノロジーズ株式会社
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ultrafineGaLF

“高濃度でしか分からないこともある”
“Highly concentrated UFB shows you something different”

finebubble@ifbt.jp



This program is supported by a subsidy from Kyoto Prefecture and Kyoto Convention & Visitors Bureau.

With the generous support of the **Kyoto University Foundation** for the Promotion of Education and Research, Nanobubble2024 has been selected to host an international conference.

Acknowledgements

Two years have passed since the Nanobubble 2022 event in Magdeburg, and we have been able to smoothly proceed with preparations for Nanobubble 2024. Being able to hold the event on-site without the need for an online format is entirely thanks to the dedicated efforts of all the staff involved, as well as the participation of everyone attending this conference. We look forward to continuing discussions with all of you and contributing to the development of fields related to Nanobubbles. We are excited to see you all again at the next event at 2026!



We would like to express our gratitude to Art Tourist for their assistance with the conference submission system and hotel reservations.
<https://art-tourist.co.jp/>



This program is supported by a subsidy from Kyoto Prefecture and Kyoto Convention & Visitors Bureau.



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