Nanobubbles for Sustainability: Transforming Agriculture and Environmental Management

Location:

Weston Hall 220 Gallery - Conference Room (ground level) New Jersey Institute of Technology 323 Martin Luther King Blvd. Newark, NJ 07102

Date: 01/24/2025

Synopsis

This workshop will delve into the transformative applications of nanobubble technology in agriculture and environmental management. With a focus on enhancing sustainable practices and addressing global challenges, the workshop emphasizes the potential of nanobubbles in pollution mitigation, soil health improvement, water efficiency, and boosting agricultural productivity. It also explores their role in carbon emission reduction and sequestration, advancing efforts toward environmental resilience.

Bringing together experts from academia, industry, and policy, the workshop will feature discussions on how nanobubbles can revolutionize water efficiency, optimize nutrient delivery, and enhance soil health in agricultural systems. Additionally, innovative strategies for pollutant degradation in water and soil, as well as carbon capture, will be explored. Participants will gain a comprehensive understanding of the science behind nanobubbles, their practical applications, and their potential to significantly impact agricultural productivity and environmental sustainability. In addition to the workshop, we are planning a field trip for participants to visit a local indoor farm in New Jersey, where they can learn about modern farming technologies, including innovative irrigation systems. This field trip is tentatively scheduled for either January 23 or January 25, 2025, with the exact date to be confirmed soon.

Sponsors and strategic partners



Center for Translational Research



Pollution

New Jersey Institute of Technology received financial support from EPA and USDA under grant agreements. NJIT are partnering with Kyoto University and Pure Nanotech to organize the 2026 Nanobubble Conference.

Workshop Agenda

09:30 AM - 10:00 AM 10:00 AM - 10:05 AM 10:05 AM - 10:15 AM

- Participant Arrival and Check-In
 Welcome and Introductory Remarks-*Dr. Wen Zhang, NJIT*Opening Remarks *Dr. Atam Dhawan, Senior Vice Provost for Research, NJIT*
 - Dr. Taha Marhaba, Chair of Department of Civil and Environmental Engineering, NJIT

Confirmed Presentations

10:15 AM - 12:35 PM Chaired by Dr. Wen Zhang and Dr. Yoshikatsu Ueda

10:15 am-10:35 am: Prof. Pan Li (Tongji University)

"Nanobubbles Promote Nutrient Utilization and Plant Growth in Aquatic Vegetation and Rice and ISO/TC 281 Standards"

10:35 am-10:55 am: Prof. Yoshikatsu Ueda (Kyoto University)

"Fundamental and Applied Research on the Electrical Properties of Nanobubbles"

10:55 am-11:15 am: Prof. Yongsheng Chen (Georgia Institute of Technology)

"Coupling Resource Recovery with Precision Digital Agriculture for Urban Sustainability and Resilience"

11:15 am-11:35 am: Prof. Samir Kumar Khanal (University of Hawai'i at Mānoa)

"Nanobubble technology applications in controlled environment agriculture"

11:35 am-11:55 am: Prof. Onur Apul (University of Maine)

"Tiny Bubbles with Massive Potential: Overview of Nanobubble-Enabled Water Treatment Technologies"

11:55 am-12:35 pm: Prof. James C. Earthman (University of California, Irvine)

"Dissolution and Prevention of Fouling Compounds using Nanobubbles"-Zoom presentation

12:35 PM – 1:30 PM: Group photo first before Lunch Break in the same workshop room

01:30 PM – 03:00 PM Chaired by Dr. Wen Zhang and Dr. Likun Hua

01:30 pm – 1:50 pm: Prof. Hamid Samouei (Texas A&M University)

"Polarizing Perspectives: Ion- and Dipole-Induced Dipole Interactions Dictate Bulk Nanobubble Stability"

01:50 pm – 2:10 pm: Prof. Shahriar Afkhami (NJIT)

"Simulations of microlayer formation in nucleate boiling"

02:10 pm - 02:30 pm: Dr. Michael Radicone, President of I2 Air Fluid Innovation

"The Environmental Impact of Vapor Infusion Nano Bubbles on Heat Exchanger Fouling"

02:30 pm - 02:50 pm: Dr. Jeff Bodycomb (HORIBA)

"Applications of Nanoparticle Tracking Analysis (NTA) for Nanobubble Analysis"

02:50 pm - 03:10 pm: Dr. Ragy Ragheb (Malvern Panalytical)

"Enhancing Nanobubble Characterization with Nanoparticle Tracking Analysis and Electrophoretic Light Scattering"

03:10 pm – 03:15 pm: Closing Summary and Reflections by Prof. Wen Zhang (NJIT)

03:15 PM – 5:00 PM: Roundtable Discussions-strategic goals and collaboration opportunities (<u>invited personnel only in Colton Hall 210 Conference Room, next to the Weston Hall</u>)

1. Formation of the U.S. Delegate for Fine Bubble Technology - ISO/TC 281

2. Planning for the 2026 Nanobubble Conference at NJIT

- Formation of the conference committee (international and the US local committee)
- Suggestions for plenary and invited speakers, exhibitors, and sponsors
- Review of previous conferences: <u>Nanobubble 2022</u> and <u>Nanobubble 2024</u>

3. Research Center Proposal Plans

- o Development of academia-industry partnerships
- Funding strategies and collaborative projects

5:00 PM Adjourn

6:00 PM-9 PM: Dinner and Networking at Campus center atrium

- Spotlight talk by Dr. Likun Hua, PureNanoTech (<u>www.purenanotec.com/</u>) on "Advancing the Frontiers of Nanotechnology Nanobubble Generation from PureNanoTech"
- Student posters

Speaker's biography

| Dr. Atam P. Dhawan, Ph.D., Senior Vice Provost for Research, Executive Director of the Center for Translational Research, Executive Director of Undergraduate Research and Innovation (URI) and Distinguished Professor of Electrical & Computer Engineering at NJIT. |
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| Dr. Taha F. Marhaba is Professor and Chairman of the John A. Reif, Jr. Department of Civil & Environmental Engineering at New Jersey Institute of Technology (NJIT). His expertise is in water quality and the development of technologies that enhance rapid characterization and treatment. Some of his notable contributions include the development of the spectral fluorescent signatures (SFS) method for characterization of organic matter and treatment using nanobubbles. |
| Dr. Yoshikatsu Ueda is an Assistant Professor at Kyoto University's Research Institute for Sustainable Humanosphere (RISH). Dr. Ueda's research encompasses plasma wave observations, fine bubble technology, and the development of advanced measurement systems. He has been instrumental in designing plasma wave instruments for micro- satellites and has led projects focusing on fine bubbles, such as microbubbles and ultrafine bubbles, exploring their applications across various fields. |
| Dr. Pan Li is an Associate Professor at the College of Environmental Science and Engineering at Tongji University and holds a dual appointment as a professor at the Tongji Hospital Affiliated to Tongji University. Additionally, Dr. Li serves as the deputy director of the Micro/Nano Bubble Professional Committee of the Chinese Society of Particuology. |
| Dr. Yongsheng Chen is an esteemed professor and director at the Georgia Institute of Technology, specifically in the School of Civil & Environmental Engineering, and leads the USDA Project on Food Energy and Water Sustainability. Dr. Chen's vast experience in academia spans various renowned institutions, including Georgia Tech, Arizona State University, and Michigan Technological University. |
| Samir Kumar Khanal is a Professor of Environmental Engineering, Dept. of Molecular Biosciences and Bioengineering, University of Hawai'i at Mānoa. Prof. Khanal is a globally recognized researcher in the field of anaerobic digestion, especially nanaerobic digestion, nanobubble technology, aquaponics, waste-to-resources, and micro/macro-algal cultivation. He is an Editor-in-Chief of highly prestigious journal, <i>Bioresource Technology</i> . |
| Onur Apul is Associate Professor of Civil and Environmental Engineering at University of Maine and transit to a faculty member at Penn State University. Dr. Apul's research focuses on responsibly harvesting nanotechnology to advance safe and sustainable water treatment. He specifically investigates molecular level interactions at the boundary layers to help tackle emerging environmental concerns (such as PFAS in drinking water sources or microplastics in coastal ecosystems). |
| James Earthman is a Professor of Materials Science and Engineering at University of California, Irvine. Dr. Earthman's research includes a broad range of deformation and damage mechanisms in both model and advanced materials. His work also involves the development and use of computer-based techniques for determining the damping characteristics of biomaterials and mechanical biocompatibility, the corrosion behavior of metals exposed to living cells, and the nondestructive characterization of surface defects in situ and the effects of nanobubbles on the stability of materials. |

| Shahriar Afkhami is a professor in the Dept. of Mathematical Sciences with a joint appointment at the Dept. of Data Science at NJIT. He has expertise in computation and mathematical modeling of interfacial flow problems, high performance computing, and application of machine learning in computational fluid dynamics. He has worked on a range of two-phase flow problems, including micro-fluidics transport, self-assembly of nano-droplets, and nucleate boiling phenomena. |
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| Hamidreza Samouei, PhD, is a chemist with expertise spanning various domains of industrial and applied chemistry. His current research area is nanobubbles studies, carbon mineralization and water treatment, and extraction of valuable minerals from diverse sources, including different types of brines (including oil and gas and geothermally produced water), clays, and algae. |
| 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. His research embraces environmental behavior and interfacial processes for nanomaterials, microplastics and soft particles such as microbes and bubbles, catalytic/reactive membrane filtration systems for desalination, resource recovery and emerging contaminant removal, photocatalysis, microalgal removal and harvesting. |
| Dr. Jeff Bodycomb, product line manager at HORIBA, has spent decades analyzing particles and is responsible for technology improvement and providing technical support to customers. Jeff has developed particle analysis instruments and analyzed materials with a variety of imaging and scattering techniques. He has worked with particle systems ranging from nanoparticles to coarse powders. Jeff has experience with nanoparticle tracking analysis, dynamic light scattering, laser diffraction, and image analysis. His areas of interest are sources of error in measurement, scattering techniques, and microscopy. |
| Ragy Ragheb is a Senior Application Specialist with Malvern Panalytical specializing in a number of light-scattering technologies and GPC/SEC product lines. Ragy received his PhD in Macromolecular Science and Engineering from Virginia Tech and completed his postdoctoral work in Biomedical Engineering at Yale University. Ragy joined Malvern Instruments (now Malvern Panalytical) in 2014 through the acquisition of NanoSight and has supported training, sales, and development of application knowledge and expertise. Ragy is well versed in various particle platforms and applications spaces, enjoys finding new and creative ways to approach problems, and collaborates with others to find solutions. |
| Michael Radicone, President and chief science officer of I ₂ Air Fluid Innovation and Specialty Product Lead for HTRI. At I ₂ Air Fluid Innovation, he developed and patented technologies that address heat exchange fouling, toxic mercury presence in fluids, flue gas scrubber enhancement, medical and dental waterline microbial fouling and aortic catheter disinfection. As specialty Product Lead for HTRI, he oversees development and integration of the Vapor Nano Bubble Infusion technology. |
| Dr. Stuart Hua is the Chief Technology Officer at PureNanoTech (PNT), where he leads the development and implementation of innovative nanobubble technologies. Since joining PNT in 2023, he has been instrumental in advancing the company's mission through his expertise in nanobubble applications. Dr. Hua has participated in multiple government-funded projects, such as the U.S. Environmental Protection Agency, the U.S. Department of Agriculture, the National Science Foundation, Grow-NY, and the New Jersey Commission on Science, Innovation, and Technology (NJCSIT). |

Campus Map



Parking:

Parking is free on Jan 24, 2025 at the NJIT Parking Deck at **154 Summit St. Newark, NJ 07103**). If the Summit Street deck is full, alternative parking is available at 42 Sylvia Jackson Way, Newark, NJ 07103, which is slightly farther from the venue.

Airports:

Out-of-town attendees should fly into Newark Liberty International Airport (EWR), Newark, NJ. The airport is 5 miles away from hotels and the meeting venue. Public transit (NJ Transit, Amtrak) taxi/ride share are available from the airport. It is possible to navigate to the meeting without a rental car

Getting There from NYC:

From New York Penn Station to Newark Penn Station: NEC, NJCL, RARV trains From Newark- Penn Station to NJIT: 10-15 minute walk Or take Newark Light Rail (To Grove Street Line) 4 stops to Warren Street/NJIT (4 mins) Bus Lanes: Raymond Blvd Side: 71/73 (Livingston Ml via St Barnabas) 5 stops to Warren St at Wilsey St 21 Orange Main & Day 5 stops to Warren St at Wilsey St Market St Bus Lane at Raymond 34B/34M (Bloomfield) 5 stops to W Market St at Wickliffe St

Hotel:

We have assembled a list of hotels around NJIT for you to choose from.

Robert Treat Hotel 50 Park Pl, Newark, NJ 07102 0.8 miles from NJIT

Hampton Inn & Suites Newark-Harrison-Riverwalk

Passaic Ave Harrison, NJ 07029 0.8 miles from NJIT

<u>Courtyard Newark Downtown</u> 858 Broad Street, Newark, NJ 07102 0.9 miles from NJIT

Hilton Newark Penn Station

1 Gateway Center Raymond Blvd, Newark, NJ 07102 1.2 miles from NJIT

Hilton Newark Airport

1170 Spring Street, Newark, NJ 07104 1.2 miles from NJIT

DoubleTree by Hilton Hotel Newark Airport

128 Frontage Road Newark, NJ 072015.1 miles from NJIT