Volume 32 Issue 3: 2023 Fall 2023

ultrasonic industry association
UIA
powering sound ideas

Vibrations

Powering Sound Ideas

UIA52: 8 - 10 April 2024 in Dublin, Ireland

The UIA is looking forward to an engaging symposium chaired by Andrew Feeney, UIA52 Symposium Chair.

UIA52 will provide a balanced program of medical and industrial presentations from experts in ultrasound from throughout Europe, UK, and the US. UIA offers the crossroads of manufacturing, research and academia that provides for in-depth discussion about the current and future applications of ultrasound.

Abstract Submission

UIA welcomes abstracts for consideration for medical or industrial ultrasonic applications.

Deadline: 19 January, 2024

Workshop Presentations

If you have an idea about an hour-long presentation on the fundamentals of ultrasound, please contact Andrew Feeney directly.

Please click here for up-to-date information about UIA52.

Submit your abstracts here

Inside this issue:

UIA52: Featured Speakers

Mark E. Schafer, Ph.D. Fellow, ASA, AIUM, AIMBE
Sonic Tech, Inc.

See page 4

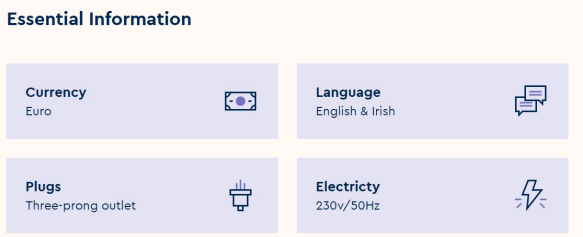
Andrew Abbott, Professor of Physical Chemistry, University of Leicester

Professor Abbott's principal expertise is in green chemistry, where he established the field of deep eutectic solvents, now a significant discipline represented by thousands of research papers in the scientific literature. His specific research interests are in the processing of materials, and he has several significant collaborations with industry, including in the development of novel solvent

Continue reading on page four about our featured speakers and programs for UIA52

Traveling to Ireland

Getting to Dublin is a breeze. Dublin Airport is one of the busiest in Europe, with hundreds of daily flights providing a huge range of options to get here. Direct flights are available from most major cities in the UK and continental Europe, several hubs in North America, and the Gulf cities of Dubai and Abu Dhabi. Connecting hubs hook up with further flights from all over the world, providing for easy access to the Irish capital.



Starting in 2025, U.S. passport holders traveling to Europe will need to apply for authorization through the European Travel Information and Authorization System (ETIAS) before their visit.

The new rules were set to go into effect in 2024, but E.U. officials announced in October the rollout would be delayed until the following year.

Hyatt Centric the Liberties, Dublin, Ireland

This convenient location makes for the perfect Dublin City Centre hotel for exploring many of the area's top attractions, uncovering history dating back centuries, and everything in-between. All that you need for a great stay and excellent 4-star hotel experience is here at Hyatt Centric The Liberties Dublin in one of the oldest parts of Dublin, The Liberties.

Make your hotel reservations

Our hotel is your starting point in the heart of Dublin. From local shops and designer stores to Dublin's #1 tourist attraction, Guiness Storehouse, Dublin offers a wide array of activities to explore during your stay at Hyatt Centric The Liberties Dublin. Step off the beaten path to discover local distilleries, walks along an 18th century sea wall, and one of Ireland's greatest cultural treasures—the Book of Kells at Trinity College Dublin.

Tuesday Evening : Dublin Liberties Distillery

This event is included in your Symposium registration; extra tickets for guests are available.

UIA52 is Multi-Access

Based on the success with offering UIA51 to virtual participants as well as those able to join in person, UIA is committed to a multi-access program.

The program will be scheduled according to the time in Dublin. However, all sessions will be available via live-streaming and then for on-demand viewing for all UIA52 participants.

Virtual participants will have access to all the presentations, including keynote speakers, industrial and medical session presentations, and the focused speakers on Tuesday morning. The question/answer sessions will be open to the virtual participants to ask their questions.

Poster presenters will be able to give a brief overview of their posters as well as having their poster and supporting data available online for symposium participants.

Created by Nicole Marie from Noun Project

UIA52 Registration is OPEN!

LIVE REGISTRATION FEES:

Members
Before 1 February $650

Nonmembers
Before 1 February $850

Students $495

Poster Presenters
$199 (includes Tuesday and your choice of either Monday or Wednesday at no additional charge

Daily registration - Members $425

Daily registration - Non-members
$599

VIRTUAL REGISTRATION FEES:

Members $650
Nonmembers $850

Daily - members $299
Daily - nonmembers $499
Students Full - $495
Students Daily - $199

Register NOW!

The best part of a UIA conference is the ability to have access to the presentation slides for future reference, which is not commonly done anywhere else.

It was really great to connect with industrial based research rather than academic to understand their research development and issues.

UIA51 proved to be very helpful this year. 3 or 4 papers exhibited technology that was really relevant to our research and development efforts.

UIA52 Invited Speakers and more

systems for industrial applications such as metal deposition and dissolution. A significant proportion of his research to date has focused on the development of novel processes using ionic liquids, targeting delamination and processing of a wide range of materials and substrates, for example in recycling technologies for electronic waste. He is currently a partner in the Faraday Institution project ReLiB (Recycling and Reuse of EV Lithium-ion Batteries) with the University of Birmingham, where he has led his team to innovate a new process for delaminating battery materials which is being scaled up for use at battery manufacturing plants in the UK. Among many other projects, he also leads the SonoCat project in partnership with the University of Glasgow, focusing on the recovery of technology critical metals from electronic waste and photovoltaic cells using a combination of targeted ultrasonics with catalytic etchants. Professor Abbott holds eleven patents, and in recognition of his achievements, he was awarded the Royal Society of Chemistry Green Chemistry and Industrial Chemistry medals.

Dr Schafer is Research Professor in the School of Biomedical Engineering, Science and Health Systems. He has extensive expertise in the development of ultrasound systems for medical applications, including combined ultrasound and therapeutic light sources for antibacterial treatment, as well as neurological applications of ultrasound. His significant experience encompasses diagnostic, therapeutic, and surgical ultrasound, in addition to devices for lithotripsy, from their initial design, through the development and testing phases in conjunction with the necessary regulatory submissions and intellectual property protection. Dr Schafer therefore has significant experience of the current standards in ultrasound technology for medical procedures, and he is at the forefront of innovations relating to ultrasonic devices for medical applications. Dr Schafer is the Principal Investigator on an interdisciplinary Pennsylvania Commonwealth Universal Research Enhancement (CURE) grant. In this research, he is collaborating with fellow Drexel University academics Dr Margaret Finley, Associate Professor in Physical Therapy and Rehabilitation Sciences in the College of Nursing and Health Professions, and Dr Peter Lewin, the Richard B. Beard Distinguished University Professor in the School of Biomedical Engineering, Science and Health Systems. Dr Schafer will be focusing his keynote presentation on the use of ultrasound for neural stimulation, including some at very small dimensions!

The Showcase Session

UIA is presenting a new format for the middle day of the symposium this year, called the Showcase Session, where we will be focusing on a series of demonstrations at the symposium venue. This exhibition will include a showcase of technology developments from the UK Sustainable Manufacturing community, including perspectives on design for recycling, reuse, and industrial upscaling. This research is a bridge between different scientific and engineering disciplines, including ultrasonics, electronics, chemistry, and materials science. There will also be an exhibition of the latest research in surgery enabled by ultrasonics, including developments from the multi-institutional UK UltraSurge research programme, led by UIA President Professor Margaret Lucas. There will also be demonstrations from industry organisations showcasing the latest technology developments. Within this programme of events, there will be a poster presentation session featuring the latest research from ultrasonic doctoral students and postdoctoral researchers. This poster presentation session will encompass many aspects of ultrasonics, from industrial to medical, experimental, and theoretical.

MEET IN IRELAND

There will be some free time in the afternoon for participants to visit one or more of the breweries and distilleries within easy walking distance of our hotel.

Our Tuesday evening social event is a tour at the Dublin Liberties Distilleries, whiskey tasting and dinner.

Fáilte Ireland
National Tourism Development Authority

Ultrasound in the News

"We showed that the challenging smaller compounds can be treated, and more effectively than the larger compounds," said co-author of the study Linda Weavers, a professor of civil, environmental and geodetic engineering at The Ohio State University. "That's what makes this technology potentially really valuable."

Ultrasound may rid groundwater of toxic 'forever chemicals'

Technique breaks up dangerous chemicals into harmless substances

Invented nearly a century ago, per- and polyfluoroalkyl substances, also known as "forever chemicals," were once widely used to create products such as cookware, waterproof clothing and personal care items. Today, scientists understand that exposure to PFAS can cause a number of human health issues such as birth defects and cancer. But because the bonds inside these chemicals don't break down easily, they're notoriously difficult to remove from the environment.

Such difficulties have led researchers at The Ohio State University to study how ultrasonic degradation, a process that uses sound to degrade substances by cleaving apart the molecules that make them up, might work against different types and concentrations of these chemicals.

By conducting experiments on lab-made mixtures containing three differently sized compounds of fluorotelomer sulfonates -- PFAS compounds typically found in firefighting foams -- their results showed that over a period of three hours, the smaller compounds degraded much faster than the larger ones. This is in contrast to many other PFAS treatment methods in which smaller PFAS are actually more challenging to treat.

One of only a few studies to probe into how ultrasound might be used to rid our surroundings of toxic PFAS chemicals

"We showed that the challenging smaller compounds can be treated, and more effectively than the larger compounds," said co-author of the study Linda Weavers, a professor of civil, environmental and geodetic engineering at The Ohio State University. "That's what makes this technology potentially really valuable."

The research was published in The Journal of Physical Chemistry A.

One of only a few studies to probe into how ultrasound might be used to rid our surroundings of toxic PFAS chemicals, this paper is an extension of previous research of Weavers' that determined that the same technology could also degrade pharmaceuticals in municipal tap and "PFAS compounds are unique because many of the destruction technologies that we use in environmental engineering for other hard-to-remove compounds don't work for them," Weavers said. "So we really need to be developing an array of technologies to figure out which ones might be useful in different applications."

Unlike other traditional destruction methods that attempt to break down PFAS by reacting them with oxidizing chemicals, ultrasound works to purify these substances by emitting sound at a frequency much lower than typically used for medical imaging, said Weavers. Ultrasound's low-pitched pressure wave com-

Continued on the next page

Ultrasound in the News, continued

presses and pulls apart the solution, which then creates pockets of vapor called cavitation bubbles.

"As the bubbles collapse, they gain so much momentum and energy that it compresses and over-compresses, heating up the bubble," said Weavers.

Much like powerful combustion chambers, the temperatures inside these tiny bubbles can reach up to 10,000 Kelvin, and it's this heat that breaks down the stable carbon-fluorine bonds that PFAS are made of and renders the by-products essentially harmless. Unfortunately, this degradation method can be costly and extremely energy intensive, but with few other options, it may be something the public needs to consider investing in to protect groundwater for drinking and other uses, said Weavers.

While manufacturing industries are starting to move away from making use of PFAS, regulatory agencies are working to heighten public awareness about how to avoid them. Earlier this year, the U.S Environmental Protection Agency proposed the National Primary Drinking Water Regulation (NPDWR), which would require public water systems to monitor for certain PFAS, notify the public of these levels and take measures to reduce them if they're over a certain limit.

While researchers have been able to separate particles based on their shape for years, the ability to control their movement has remained a largely unsolved problem, until now.

Because ultrasound is so effective at cleaning PFAS from solutions, the study concludes that scientists and government agencies should consider using it in future treatment technology development as well as along with other combined-treatment approaches.

Though Weavers' research is not ready to be scaled up to aid in larger anti-contamination efforts, the study does note that their work could be the opening move toward creating small, high-energy water filtration devices for public use inside the home.

"Our research revolves around trying to think about how you scale to something bigger and what you need to make it work," said Weavers. "These compounds are found everywhere, so as we learn more about them, understanding how they can degrade and break down is important for furthering the science."

Other co-authors are William P. Fagan and Shannon R. Thayer, both of Ohio State.

https://www.sciencedaily.com/releases/2023/09/230929131545.htm

Researchers use ultrasound to control orientation of small particles

The demonstration has implications for drug delivery and bioprinting, according to scientists

Acoustic waves may be able to control how particles sort themselves.

While researchers have been able to separate particles based on their shape -- for example, bacteria from other cells -- for years, the ability to control their movement has remained a largely unsolved problem, until now. Using ultrasound technology and a nozzle, Penn State researchers have separated, controlled and ejected different particles based on their shape and various properties.

They published their results in the journal Small.

"We engineered a microchannel nozzle and applied ultrasound energy to the system," said corresponding author Igor Aronson, the Penn State Dorothy Foehr Huck and J. Lloyd Huck Chair

Continued on the next page

Ultrasound in the News, continued

Professor of Biomedical Engineering and professor of chemistry and of mathematics. "The nozzle plays two roles. It concentrates fluid flow, which is something other researchers have done. But in addition to that, the walls of the nozzle reflect the acoustic waves of the ultrasound energy."

Aronson and his collaborators worked with tiny materials called nanorods, which are some of the most studied synthetic self -propelled particles, according to Aronson. Because they are a similar size and have a similar swimming speed to bacteria, Aronson said, many of the conclusions drawn from observing nanorods can be applied to bacteria movement. For this reason, they are often used as proof of concept for future separation tasks.

In this case, the nanorods were half platinum and half gold. The researchers placed the nanorods in a nozzle, shaped like a miniature syringe, and then added hydrogen peroxide. The hydrogen peroxide is decomposed -or burned - on the platinum half of each nanorod, forcing them to swim in an imitation of how bacteria behave.

The researchers applied ultrasound to the nozzle, producing acoustic waves that, along with the flow of fluid, were able to separate the nanorod particles, aggregate them or extrude them from the nozzle."The separation concept relies on the fact that nanorods and spherical particles have different responses to acoustic radiation and generated fluid flow," Aronson said. "By controlling the nozzle shape and the frequency and amplitude of the acoustic radiation, we can coerce particles of different shapes and material properties to behave differently. This, especially, applies to active particles such as nanorods: They can swim autonomously, and their control is especially challenging."

> "Potential bioprinting applications may include designing acoustic nozzles for bio-inkjet-like printers,"

This level of control in separating out particles had not been demonstrated previously, according to the researchers.

Aronson said this demonstration has implications for future technologies, including additive manufacturing, also known as 3D printing, and drug delivery.

"For 3D printing, the idea is you can add certain additives to the ink -- for example, nanorods," he said. "So now, we could separate nanorods from spherical particles to deposit only some in the printout, such as depositing polymers without nanorods and so on, all to change the property of the printout."

Aronson said this principle also applies to printing living cells, known as bioprinting.

"Potential bioprinting applications may include designing acoustic nozzles for bio-inkjet-like printers," he said. "By controlling the acoustic radiation in the nozzle, we can potentially extrude certain types of cells -- for example, stem cells -- and trap other types -- for example, bacteria. It's an additional control for bioprints."

This capability could also be useful for separating bacteria from cells in targeted drug delivery, Aronson said. The researchers next plan to mix live bacteria and cells in a lab setting and then separate and control them.

The paper's other authors are Leonardo Dominguez Rubio, a graduate student in the Penn State Department of Biomedical Engineering; Ayusman Sen, the Verne M. Willaman Professor of Chemistry at Penn State; and Matthew Collins, who was a Penn State chemistry graduate student at the time of this work.

The U.S. Department of Energy supported this work.

www.sciencedaily.com/releases/2023/06/230627123112.htm

From the President

Margaret Lucas

UIA President

Now that we are back into the swing of in-person conferences, we are all looking forward to meeting up again with old and new friends at the UIA Symposium in Dublin, Ireland in April. Planning for the conference is well underway and we hope you are all busy preparing to submit abstracts and will join us in Dublin. For those that can't make the trip to Ireland, we offer the opportunity to join us virtually. Our virtual platform has proved very successful in our two most recent conferences and will allow you to join all the presentations and discussions. The symposium Chair is again in Andrew Feeney's capable hands, with lots of help from the UIA Board, so we know it will be another fantastic meeting.

Continuing our successful series of on-line Virtual Collaborations, Mark Delsman, a Systems Engineer for Johnson & Johnson Surgical Vision, led an event in October on 'Contrasting Ultrasonic Design Challenges in Wire Bonding and Phacoemulsification'. Virtual Collaborations is a great way to learn about research and technology fundamentals and applications in power ultrasonics and we particularly appreciate the interest and engagement of early career engineers from academia and industry. We would welcome suggestions for future topics and, of course, offers to give talks.

With our clocks going back recently in the UK, winter approaching, and the Scottish days getting shorter and shorter, it reminds me to wish you all a happy holiday season and we look forward to seeing many of you in spring.

UIA Board

Ultrasonic Industry Association
11 W Monument Ave, Ste 510
Dayton OH USA

Phone: +1.937.586.3725
uia@ultrasonics.org

ultrasonic industry association
UIA
powering sound ideas

VISIT US AT
ULTRASONICS.ORG

How can ultrasonics enhance the value of your business?

UIA is the international business forum for users, manufacturers, and researchers of ultrasonics. Our members use acoustic vibrations to improve materials, industrial processes, and medical technology. We call this *powering sound ideas.*

Let's work together to power your sound ideas. Contact a member consultant or company through our online Referral Network, learn about ultrasonics with our online primer, or meet industry leaders at our next symposium.

Important Dates

UIA 52
powering sound ideas
8 - 10 April 2024
Hyatt Centric, Dublin, Ireland

19 January, 2024: UIA52 Abstract Submission Deadline

25 January 2024: Virtual Collaborations Xuan Li, University of Glasgow

8 - 10 April 2024: UIA52, Hyatt Centric The Liberties, Dublin, Ireland

6 - 9 May 2024: 2024 Int'l Workshop on Acoustic Transduction Materials and Devices, Penn State