CONFERENCE
BOOKLET

Levitronix®
CMP & Ultrapure
Chemicals Conference

August 28, 2026
Sheraton Hsinchu Hotel
Zhubei City | Taiwan

LEVITRONIX®

The Levitronix® CMP & Ultrapure Chemicals Conference brings together industry experts to exchange technical insights and address key manufacturing challenges.

Progress through **Collaboration**

Rapid innovation in semiconductor devices, combined with increasing process complexity and tighter performance requirements, continues to challenge manufacturing at every level. Emerging technologies in materials, equipment, and process control are redefining established manufacturing paradigms.

We at Levitronix® believe that to build on the progress that the industry has made, end-users, system – and component suppliers must come together to reinforce what it takes to foster the trust and tight collaboration that are vital to the future success of semiconductor manufacturing.

Preliminary Conference **Agenda**

AM

8:45 Registration and Breakfast *Provided by Levitronix®*

9:15 **Keynote**
Current Trend in CMP Slurry Technology
Prof. Taesung Kim | Sungkyunkwan University

9:30 **Liquid Particle Monitoring System Utilizing Aerosol Metrology and Data Processing Algorithm: Chemical Mechanical Polishing Slurry Application**
Prof. Dong-Bin Kwak | Seoul National University of Science and Technology

10:00 **Preserving CMP Slurry Health: The Impact of Pump Technology on Advanced CMP Processes**
Gary Van Schoonenveld | CT Associates

10:30 Coffee Break *Provided by Levitronix®*

11:00 **Low-Shear-Stress Slurry Dispense System (SDS) Technology**
Hsiu-Yu Fan | Creative System Technology Ltd.

11:30 **Tangential Flow Filtration of Ceria Slurry: Application of a Single-Pass Method to Improve Buff Cleaning**
Prof. Taesung Kim | Sungkyunkwan University

PM

12:00 Round Table Buffet Lunch *Provided by Levitronix®*

1:30 **Insight-Driven Process Development: From Fundamentals to Application**
Dr. Thomas Nuytten | IMEC

2:00 **On-Demand Inline Mixing of SC1 Chemistry for Stable Multi-Tool Wet Cleaning Supply**
Christoph Leibl | Qualcomm
Benjamin Senfter | Inno-Cube GmbH

2:30 **BATCHSPRAY® Technology: Enabling Residue-Free Dies for Advanced Semiconductor Packaging**
Bernhard Hammerl | siconnex customized solutions GmbH

3:00 Coffee Break *Provided by Levitronix®*

3:30 **Designing for Prevention of Electrostatic Discharge in Process Chemical Applications**
Karl Urquhart | Exentec

4:00 **Improvements of Wet Chemical Etch Equipment (SAT) in Semiconductor Production**
Dr. Ursula Meyer | Infineon Technologies Austria

4:30 Coffee Break *Provided by Levitronix®*

4:45 **Mitigating Chamber-to-Chamber Exhaust Crosstalk via Closed-Loop Fan Control in Single-Wafer Wet-Processing Equipment**
Dante Ros Gonzalez | NexGen Wafer Systems GmbH

5:15 **Enhancing Wetbench Performance for Si Wet Etching Under Exhaust Limitations via Levitronix® BFS Integration**
Stefan Zuercher | AP&S International GmbH

5:45 **Comparison of Particle Shedding from Different Fan Technologies for ISO Class 1 Environments**
Dr. Ivana Ferstera | Levitronix GmbH

6:15 Drinks Reception

Prof. Dong-Bin Kwak

Seoul National University of Science and Technology, Assistant Professor of Manufacturing Systems and Design Engineering

Dong-Bin is an Assistant Professor of Manufacturing Systems and Design Engineering at Seoul National University of Science and Technology (SeoulTech), where he leads the Nanoparticle Engineering Laboratory and serves as an investigator with the Center for Filtration Research (CFR). His group collaborates with industry on CMP-slurry defect metrology, in-line liquid nanoparticle monitoring that couples aerosol generation with detection, and environmental testing of filtration systems. Before joining SeoulTech, he was an Applications Scientist in the Inspection Business Unit at Onto Innovation (Chandler, AZ), developing next-generation 2D/3D automated optical inspection (AOI) for panel-level packaging.
Dong-Bin earned his Ph.D. in Mechanical Engineering from the University of Minnesota's Particle Technology Laboratory (2017–2023), where he worked on contamination control in air- and liquid-phase systems, nanofiber filter pressure-drop modeling, and soft-X-ray-assisted detection of VOCs. He has received the KSMPE Young Engineer Award (2024) and American Filtration and Separations Society Fellowships (2019, 2023). He has authored 30+ peer-reviewed papers in aerosol science, filtration, and thermal-fluids.

Liquid Particle Monitoring System Utilizing Aerosol Metrology and Data Processing Algorithm: Chemical Mechanical Polishing Slurry Application

This study presents an aerosol-metrology approach using an integrated atomizer–SMPS (A-SMPS) to measure NVR-subtracted hydrosol particle size distributions (HPSDs). Standard polystyrene latex (PSL) nanospheres and three chemical mechanical polishing (CMP) slurries (two silica-based and one ceria-based) were measured with the A-SMPS. A multi-stage algorithm converts the SMPS-measured aerosol particle size distribution (ASD) into an NVR-subtracted hydrosol particle size distribution by sequentially (i) removing non-volatile residues (NVRs) generated during aerosolization to yield the NVR-subtracted aerosol particle size distribution and (ii) applying an empirically derived calibration based on PSL references.

Experimental results indicate that this approach yields consistent HPSDs across different dilution factors (DFs), effectively separating abrasive particle peaks from surfactant-induced NVR peaks. For the ceria and two silica slurries, the peak positions and amplitudes were nearly invariant across DFs confirming the robustness of the ASD-to-HPSD inversion and the accuracy of the DF-corrected original number concentrations. Integrating aerosol-based detection with the inversion process offers a precise and flexible strategy for quantifying ~ 100 nm abrasive particles in CMP slurries, and enables accurate hydrosol characterization for semiconductor process optimization.

Gary van Schoonenveld

CT Associates, Inc.
President

Gary Van Schooneveld, President of CT Associates, Inc., is a leading authority in nano-scale particle detection with over 35 years of semiconductor industry experience. His current focus is on the detection of sub-10 nm particles and particle precursors in liquids and establishing correlations between liquid contaminates to on-wafer defects through collaborative R&D studies with major material and component suppliers.

Gary serves as Co-chair of the IRDS Critical Components, IRDS UPW Task Force and the SEMI Ultrapure Water Task Force, leading development of multiple industry standards including SEMI F104, SEMI C93, SEMI C79 and SEMI F121. Recent honors include the SEMI Leadership Award (2024) and Advance Nanocontamination Measurement Service Award (2025). He is author of over 60 technical papers and presentations and holds BS and MS degrees in Materials Engineering from Rensselaer Polytechnic Institute and an MBA from UT Arlington.

Preserving CMP Slurry Health: The Impact of Pump Technology on Advanced CMP Processes

As semiconductor scaling advances, tolerances for Chemical Mechanical Planarization (CMP) defectivity become increasingly strict. CMP relies heavily on the colloidal stability of slurries, which depends on a delicate balance of repulsive and attractive forces. During distribution, mechanical handling can overcome repulsive electrostatic barriers, causing particles to agglomerate. Preventing the growth of the overall Particle Size Distribution (PSD) “tail” (particles > 1 μm) is critical, as these oversized aggregates cause severe mechanical defects like micro-scratches that reduce manufacturing yield. Proper selection of slurry handling equipment is therefore vital to maintain baseline PSDs and minimize defectivity.

Historically, slow-moving bellows and diaphragm pumps were favored for slurry delivery as perceived “low shear” devices, while high-speed centrifugal pumps were avoided due to shear concerns. To assess the validity of this assumption, continuous circulation tests compared the effects of bellows, diaphragm, and magnetically levitated (maglev) centrifugal pumps on slurry health. Nine commercial CMP slurries (fumed/colloidal silica, alumina, and ceria) were circulated for up to 1,000 tank turnovers, and their PSDs were continuously monitored.

During this study, it was found that circulation with bellows and diaphragm pumps caused rapid, significant increases in large particle concentrations (≥ 0.56 μm), often multiplying 20 to 70 times over 1,000 turnovers. Conversely, the maglev centrifugal pump caused minimal to no increase in the large particle tail across abrasive types. In some cases, the maglev pump’s moderate shear beneficially broke apart loose agglomerates.

Further testing was conducted to isolate the effects of fluid shear from cavitation by running a maglev pump at a constant speed while varying inlet pressure. Results demonstrated that shear alone does not damage the slurry; instead, the violent collapse of bubbles during cavitation is the primary mechanism causing particle agglomeration. Volumetric pumps inherently generate high cavitation probabilities during suction and within check valves, causing the observed PSD degradation.
This presentation will review the results of these, and other studies conducted to assess the impact of slurry handling components on slurry health.

Chair Person & Keynote Speaker

Prof. Taesung Kim

Sungkyunkwan University
Professor, School of Mechanical Engineering (ME), Department of Semiconductor Convergence Engineering, and SAINT

Dr. Taesung Kim received his Bachelor's in Mechanical Engineering from Seoul National University, Korea in 1994. He received his Master's, and Ph. D. in Mechanical Engineering from University of Minnesota, USA in 1998 and 2002, respectively. He joined Seagate Technology in 2002 and worked as Sr./ Staff Engineer in Recording Head R&D.

Since 2005 Dr. Kim has been a professor in the School of Mechanical Engineering and SKKU Advanced Institute of Nanotechnology (SAINT), Sungkyunkwan University in Suwon, Korea. In 2014, he was appointed as SKKU Young Fellow and started working for SKKU Research & Business Foundation as a Vice President. During 2019 and 2020, he worked as a Vice President of Admission and he is currently a dean of College of Engineering starting 2023. His research interests include 2-D material synthesis using plasma process, optical fiber sensors, semiconductor fabrication process (CMP, cleaning and contamination control), and atmospheric/indoor aerosol control.

Tangential Flow Filtration of Ceria Slurry: Application of a Single-Pass Method to Improve Buff Cleaning

As the device manufacturing trend becomes vertical, the number of CMP (Chemical mechanical polishing) process steps is increasing to enable next-generation chip fabrication and its performance improvement. Due to the design rule shrinkage, the role of CMP slurry, which exhibits significant chemical and mechanical reactions with the wafer surface, has become important. CMP slurry contains various chemical and physical properties such as abrasive material (SiO_2, CeO_2, etc.), shape, and particle size, which also imply the possibility of affecting CMP performance and defect generation. Through various studies, it has been reported that smaller abrasives are difficult to remove in the post-CMP cleaning process [1], and largeer abrasives cause micro-scratches and poor roughness on the wafer surface [2].

In this study, a comparative evaluation of CMP performance and cleaning efficiency was conducted by applying the tangential flow filtration (TFF) to the CMP slurry. In the TFF, the direction of fluid feed and filtration is perpendicular to each other. Due to these structural characteristics, the TFF has an advantage of longer lifetime as filter cake formation is prevented. The TFF was applied to a calcined ceria slurry with a broad abrasive size distribution, and filtration was attempted for smaller abrasives below 50 nm. As a result of the optimization of the TFF system, we achieve a certain level of filtration efficiency of smaller abrasives (42.4 %) and minimize the loss of larger abrasives (below 9.0 %). Compared to the original slurry, the filtrated slurry showed the improved buff cleaning efficiency by 18.1 % while maintaining the polishing performance. Furthermore, since the TFF can be applied to filtration of larger abrasives, it can be used to remove lager abrasives of CMP slurry to minimize micro-scratches and reduce roughness.

Hsiu-Yu Fan

Creative System Technology Ltd.
Technical Engineer

Hsiu-Yu Fan serves as a Technical Engineer at CST Ltd., specializing in polymer dispersion engineering for Chemical Mechanical Polishing (CMP) slurry systems.

He received his M.S. degree in Organic and Polymeric Materials from National Taipei University of Technology (Taipei Tech), where he developed in-depth expertise in polymer-particle interactions, dispersion stability, and rheological behavior of colloidal systems. His current technical focus lies in the optimization of intra-slurry polymer dispersion, fully integrated with CST's proprietary low-shear-stress Slurry Dispense System (SDS)—a U.S.-patented architecture employing a low-speed rotational mixing pump that replaces conventional high-speed jet agitation. By bridging polymer chemistry with shear-stress-controlled equipment design, his work systematically mitigates particle agglomeration and Large Particle Count (LPC) generation, enhances slurry uniformity and process stability, and delivers measurable improvements in wafer surface quality and CMP yield.

Low-Shear-Stress Slurry Dispense System (SDS) Technology

This presentation examines how shear stress within a CMP (Chemical Mechanical Polishing) Slurry Dispense System affects slurry quality and wafer yield. During mixing, circulation, and filtration, high shear stress causes slurry particles to aggregate, generating Large Particle Counts (LPC) that scratch wafer surfaces and reduce yield. In contrast, low shear stress keeps particles well-dispersed, ensuring stable slurry properties and consistent material removal.

A low-shear-stress design is introduced, replacing traditional high-speed jet agitation (with 3 mm tiny-hole flow) with a low-speed mechanical rotation that creates a large rotating region, dramatically reducing shear intensity and component damage risk. CFD simulations evaluated tank bottom angles (10°, 20°, 30°) and stirring speeds (100, 500, 1000 rpm) to identify optimal mixing parameters.

The SDS architecture separates mixing and filtration into independent loops using a patented low-shear mixing pump alongside maglev filtration pumps, improving uniformity, filtration efficiency, and flow stability. A zero-residue full-loop cleaning function applies custom DIW pressure with N_2 cycle purge to eliminate dead-end and branch-line residues. Stability data show variability levels for conductivity, pH, specific gravity, and H_2O_2 well below traditional out-of-control and out-of-spec thresholds, confirming superior slurry quality and reduced wafer scratch rates.

Dr. Thomas Nuytten

IMEC Belgium
Principal Scientist

Thomas Nuytten is currently Principal Scientist at imec where he defines and coordinates scientific projects addressing fundamental research questions in the field of wet processing (wet etch and clean, CMP, plating). Before this role, Thomas received the Ph. D. degree in physics from the KU Leuven in 2009 and subsequently worked as a postdoctoral researcher in the field of semiconductor nanostructures and energy conversion systems.

In 2013, he joined imec in Leuven where his main interests included spectroscopic characterization of next-generation semiconductor technologies and EUV ultrafast phenomena. As Principal Member of Technical Staff he was responsible for the Raman and photoluminescence service and research at imec and the project management of the EUV laboratory AttoLab.

Insight-Driven Process Development: From Fundamentals to Application

Driven by the relentless growth in the depth and breadth of semiconductor application domains, the processes and material systems underpinning next-generation logic, memory, and interconnect technologies are becoming increasingly complex and interconnected. This growing complexity amplifies the need for innovative materials, processes, and integration solutions that can enable future semiconductor manufacturing. Imec addresses this challenge by accelerating technology development through deep expertise and a strong focus on fundamental understanding. Only by comprehensively understanding the underlying physical and chemical mechanisms of a process can development move beyond incremental optimization and toward true innovation.

In this presentation, I will illustrate this philosophy through a few case studies. Strain engineering, for example, offers significant potential to sustain future device performance scaling, but requires advanced metrology and in-depth analysis to understand and control strain evolution throughout the fabrication flow. A second example concerns the atomic-scale interface control required in increasingly complex logic and memory stacks. I will discuss several approaches that provide insight into these phenomena, which ultimately govern device performance, reliability, and yield in next-generation semiconductor technologies.

Christoph Johannes Leibl

Qualcomm
Associate Engineer

Christoph Leibl is an Associate Engineer at RF360 Europe GmbH, a subsidiary of Qualcomm. He has been working in the wet process domain for several years, where he is responsible for both cleaning processes and the associated equipment engineering. His scope of work includes technical ownership, stable operation, and continuous improvement of cleaning systems used in semiconductor manufacturing.

He began his professional career with an apprenticeship as a mechatronics technician at Qualcomm, formerly EPCOS. After completing his training, he worked in maintenance, supporting a variety of tools used in semiconductor production. Based on this hands-on experience, he pursued further education and obtained the qualification of state-certified mechanical engineering technician with a specialization in development and design.

Following his graduation, he joined the engineering department as an Engineering Technician, focusing on wet process equipment. In his current role, he combines technical responsibility with process ownership for cleaning systems.

Benjamin Senfter

Inno-Cube GmbH
Electrical & Process Engineer

Benjamin Senfter is a mechatronics engineer currently completing his Bachelor's degree in Industrial Engineering and Management at Kufstein University of Applied Sciences.

A semester abroad at the University of Turku in Finland further broadened his academic background with international and interdisciplinary experience.
Since 2021, he has been working at Inno-Cube GmbH in Tyrol, Austria, where he is involved in the development of on-demand inline mixing modules. His work focuses on the integration of software, electronics, and mechanical engineering within complex mixing system applications.

With a holistic understanding of the functional and process-related requirements of modern mixing systems, he contributes to their continuous technological development. In addition, he is responsible for translating customer-specific requirements into practical solutions while balancing technical, economic, and application-oriented considerations.

On-Demand Inline Mixing of SC1 Chemistry for Stable Multi-Tool Wet Cleaning Supply

SC1 cleaning (Standard Clean 1) is a key process step in semiconductor manufacturing for removing particles and organic contaminants from wafer surfaces. Reliable cleaning performance and long-term process stability depend strongly on the accurate chemical composition of the SC1 solution, typically consisting of NH_4OH, H_2O_2, and DI water. Even minor deviations from the defined target concentration can result in fluctuating process performance, increased chemical consumption, and undesired effects on wafer surface quality.
This presentation introduces an on-demand inline mixing concept for SC1 generation based on a DI-water-controlled pressure and flow approach. The individual chemical components are dosed by flow-controlled Levitronix pumps, allowing precise adjustment of the volume flows and therefore the required mixing ratio. A central objective of the system is to ensure that the generated SC1 mixture consistently reaches the defined target concentration before entering the central supply loop, from which multiple wet cleaning tools are continuously supplied.

Compared with conventional batch preparation and large-volume storage tanks, inline mixing enables demand-based chemical generation directly according to process requirements. This reduces chemical overproduction, minimizes disposal caused by limited shelf life or expired storage times, and supports improved sustainability and cost efficiency.

The talk focuses on the technical and process-related requirements for implementing such a system in an industrial semiconductor environment. Key aspects include pressure and flow control accuracy, interaction between the individual media streams, mixture stability, response behavior under varying tool demand, and reliable operation of the central supply loop. In addition, typical challenges observed during implementation and operation are discussed, together with suitable technical and process-based solutions.
The presentation demonstrates how controlled on-demand inline mixing can support stable target concentrations, reproducible cleaning performance, reduced chemical consumption, and reliable wet process operation in advanced semiconductor manufacturing.

Bernhard Hammerl

siconnex customized solutions GmbH
Head of Business Development

Bernhard has been with Siconnex for over 16 years, building his career through a strong technical and operational foundation. He began as a Service Technician and steadily progressed to Process Engineer, taking over the leadership of the Process Department for 10 years, including responsibility for the demo laboratory and process development. With this hands-on and leadership experience, Bernhard developed a deep understanding of both technology and customer needs. He now contributes his expertise in Business Development, where he focuses on identifying market trends, evaluating industry innovations, and driving forward-looking initiatives within Siconnex.

His unique combination of practical experience, technical knowledge, and strategic perspective makes him well-equipped to support innovation and growth in a rapidly evolving industry.

BATCHSPRAY® Technology: Enabling Residue-Free Dies for Advanced Semiconductor Packaging

Wafer dicing has always been a critical step in semiconductor manufacturing. Today, it has become more important than ever, particularly with the emergence of advanced packaging technologies such as 2.5D and 3D integration, where clean and damage-free dies are essential for downstream processes. Conventional dicing methods, including blade sawing and laser dicing, often generate significant debris and can introduce damage to the die surface and edges. To mitigate these effects, protective photoresist layers are commonly applied prior to dicing. However, after singulation, these layers must be completely removed to expose the underlying structures for further processing. This presents an additional challenge, as diced wafers remain mounted on tape frames, making handling and cleaning more complex.

Siconnex addresses these challenges with its BatchSpray technology, offering an integrated and automated solution. The system enables safe and efficient handling of tape frames, allowing the wafer to be processed directly within the process chamber without the need for manual intervention. Cleaning is performed using the SicOzone process, which effectively removes dicing residues while simultaneously stripping the photoresist layer. The result is a clean, residue-free die, ready for subsequent manufacturing steps.

In the context of advanced packaging, plasma dicing—particularly using the BOSCH process—introduces an additional challenge, as polymer residues can form on the sidewalls of the dies. These residues may detach during later processing, potentially leading to contamination and defects. Siconnex addresses this issue by combining its ozone-based cleaning approach with a percTM (Post-Etch Residue Clean) process, enabling efficient removal of these polymer deposits.

Overall, Siconnex's BatchSpray technology provides a compact, flexible, and process-adaptable solution that meets the evolving requirements of modern semiconductor manufacturing.

Karl Urquhart

Exentec
Principle Engineer Process | Chemical Systems Product Manager

Karl Urquhart is a Principal Engineer Process and The Chemical Systems Product Manager for exentec Media Supply Nampa Idaho. He is an innovative experienced process engineering expert with 40 years of experience in the Advanced Electronic, Chemical Processing, and Semiconductor industries. Notably working for such companies as the US Navy, Air Liquide, Diversified Fluid Solutions, and Exyte over those years.

He has received multiple inventor recognitions awards, numerous patents, as well many other accolades in chemical processes, handling, and associated equipment applications. His work influence and technology contributions are global. His developed processes and technology continue to be a big part of today's chemical operations in the industries he serves.

Designing for Prevention of Electrostatic Discharge in Process Chemical Applications

In high-purity chemical systems, maintaining ultra-pure fluid systems and eliminating electrostatic discharge (ESD) events are critical to safety, while preventing damage to equipment and avoiding any induction of contaminates, ensuring the final objective product is unaffected and maintains its integrity. While the new ESD prevention products are essential for the elimination of ESD events, it has proven important to show they do not introduce additional contaminants, such as TOC, ionic extractables, or particulates.

Ensuring no induce electrical charges in the process chemicals themselves. Therefore, if the quality, purity of the ESD potential chemical is impacted by stainless steel contact (no induced ionic impurities allowed), a liquid contacting PFA carbonized conductive pathway or carbonized plastic construction path is the only alternative. In the following we show the testing, data, and ultimate effectiveness of solutions used for the designing for prevention of electrostatic discharge in process chemical applications.

Dr. Ursula Meyer

Infineon Technologies Austria
Senior Project Manager

Ursula Meyer received her Ph.D. and M.Sc. degrees in Technical Chemistry from the Graz University of Technology in 2000, with research focused on polymer surface modification. She also completed a postdoctoral appointment at DSM Research. She began her career as an Assistant Professor at TU Graz before moving into applied research and industry roles at TNO and Nordson Corporation / March Plasma Systems, followed by a position as Market Sales Manager at Ciba Specialty Chemicals.

Since 2011, she has been with Infineon Technologies in Villach, Austria, where she serves as Senior Project Manager for System Solutions in the Power & Sensor Systems division. Her work combines expertise in semiconductor processes, plasma and wet chemical technologies with strong project management and international collaboration skills, and she regularly represents her organization at conferences and industry events.

Improvements of Wet Chemical Etch Equipment (SAT) in Semiconductor Production

This presentation, titled "Improvements of Wet Chemical Etch Equipment SAT to Support Infineon Zero Defect Strategy," discusses the motivations, challenges, and solutions implemented to enhance the performance of the Spray Acid Tool (SAT) equipment used in wet chemical etching processes.

The SAT equipment is crucial for various processes in semiconductor production, including etching of materials such as aluminum, silicon, copper, tungsten, and titanium-tungsten, as well as resist removal, rinsing, and drying. However, the used equipment faced challenges such as poor process stability, with a cpk 30% below the target, and high wafer scrap rates, far above the target of the Zero Defect Strategy.

To address these issues, the team implemented several improvements. A logic controller was integrated and programmed in-house to enhance equipment stability and reduce downtime. The modifications also included the replacement of certain components, such as installing bearingless pumps and the integration of sensors.

The results of these improvements were significant, with a 50% reduction in equipment downtime and a 50% reduction in wafer scrap ratio. These enhancements not only improved the overall efficiency of the SAT equipment but also supported Infineon's Zero Defect Strategy. The presentation highlights the importance of continuous improvement and investment in complex and in-depth hardware to achieve high-quality and reliable semiconductor manufacturing processes.

Overall, the improvements made to the SAT equipment demonstrate a successful approach to addressing performance challenges and achieving significant reductions in scrap and downtime.

Dante Ros Gonzalez

NexGen Wafer Systems GmbH
Principal System Engineer

Dante Ros Gonzalez received the M.Sc. degree in Mechatronics and Micro-Mechatronic Systems from the EU4M Consortium in 2019, and the Executive MBA from IESE Business School, Munich, Germany, in 2024.

He is currently Principal System Engineer at NexGen Wafer Systems GmbH, Villach, Austria, where he aids in the development of single wafer wet-processing platforms. He leverages hands-on engineering experience in diverse industries including proppant processing for oil & gas, process control in mineral processing, and automation of paper and steel mills, to innovate in semiconductor manufacturing equipment.

Mitigating Chamber-to-Chamber Exhaust Cross-talk via Closed-Loop Fan Control in Single-Wafer Wet-Processing Equipment

This work presents an implementation of actively controlled exhaust fans on a multi-chamber single-wafer wet-processing platform and quantifies their impact on exhaust reproducibility at the equipment level. Closed-loop control using differential pressure sensors maintains recipe-defined setpoints across all chambers and process levels, eliminating chamber-to-chamber crosstalk and facility-induced fluctuations.

This approach transforms exhaust from a variable disturbance into a deterministic process boundary condition. Chamber-dedicated exhaust fan control enables precise air balance management between different process steps, supporting process-specific pressure profiles while optimizing facility exhaust requirements. In synergy with active exhaust control, chamber-dedicated Fan Filter Units (FFUs) gradually adjust fan speed to provide the required positive pressure and laminar airflow during processing, while reducing speed during idle equipment conditions to match optimized exhaust rates and maintained precise air balance.

Although this study does not yet include process performance data, it provides technical considerations for the safe extraction of chemical vapors during wet processing using an active exhaust and filter-fan control strategy, as well as quantitative pressure data that serve as prerequisites for future work in rigorously linking exhaust behavior with process performance and yield.

Stefan Zuercher

AP&S International GmbH
Head of Process Technology

Stefan Zuercher is the Head of Process Technology at AP&S and has more than 15 years of experience in the semiconductor industry. He joined AP&S in 2011 as a process engineer for wet processes (etching, cleaning, drying, electroless UBM metallization), installing and qualifying wet process equipment worldwide for over a decade.

In 2014, he became the manager of the newly established AP&S DemoCenter, and in 2017 he advanced to Process Manager. In this role, he was responsible for all process-related tasks, including tool qualifications and optimization, as well as process development across AP&S equipment platforms for singlewafer, batch, and parts-cleaning applications for advanced semiconductor manufacturing.

Since 2024, as Head of Process Technology, he has fully focused on delivering customer-oriented process solutions across the AP&S product portfolio and DemoLAB, as well as driving advancements in simulation engineering within the AP&S SimLAB.

Enhancing Wetbench Performance for Si Wet Etching Under Exhaust Limitations via Levitronix® BFS Integration

A reliable and sufficiently dimensioned exhaust infrastructure is a fundamental prerequisite for the safe and stable operation of wet process equipment. Efficient extraction of highly corrosive chemical vapors (e.g. HF, HNO3) is essential to maintain controlled process conditions, ensure personnel safety for operators and maintenance engineers, and prevent long-term degradation of equipment components caused by chemical exposure.

During chemical start-up of a compact wetbench used for silicon wet-etching, insufficient exhaust performance was observed particularly during the wafer transfer step from the etch tank to the rinse tank. As the wafers exit the chemical bath, highly corrosive and toxic NO_x-containing vapors are generated due to the reaction between residual etchant on the wafer surfaces and ambient oxygen. The release rate increases sharply at the air–liquid interface, creating a transient emission peak that must be effectively removed by the local exhaust system to avoid fugitive emissions and process-area contamination.
With the exhaust system already operating at full capacity, no further optimization was possible within the existing setup. Exhaust volume flow was identified as the key factor for rapid removal of chemical vapors. A Levitronix® BFS high-performance fan was therefore installed and qualified, enabling the wet bench's release for production.

To assess interactions between the tool, cleanroom, and exhaust infrastructure, the entire scenario was subsequently simulated using AP&S SimLAB. The resulting insights improved understanding of system behavior and have been applied to other customer projects facing insufficient exhaust capabilities.

Dr. Ivana Ferstera

Levitronix GmbH
Scientific Advisor

Ivana Ferstera, PhD, is a Scientific Advisor at Levitronix GmbH. She obtained her PhD in Mechanical Engineering from ETH Zurich, where she conducted her doctoral research in collaboration with Levitronix®. Her research focused on the design and development of novel magnetically levitated fans for semiconductor applications, particularly for systems used in DUV lithography excimer lasers.

She now applies this expertise to scientific research on magnetically levitated fans for the semiconductor industry, with a focus on data generation for applications in ISO Class 1 environments. Additionally, she works on applications of this technology in aseptic isolator systems within the pharmaceutical industry.

Comparison of Particle Shedding from Different Fan Technologies for ISO Class 1 Environments

Air handling systems are an essential part of semiconductor manufacturing, supporting contamination control throughout the fabrication process. Fans are widely used in applications such as air handling units, fan filter units (FFUs) and process exhaust systems, where extremly high standards of air purity, temperature and humidity control must be maintained. While conventional mechanically supported fans combined with high-efficiency filters are well established in these applications, magnetically levitated (maglev) fans are emerging as a promising technology for contamination-critical air handling.

Maglev fans enable contact-free rotor levitation and rotation, eliminating mechanical wear and the need for lubrication while providing precise active rotor position and speed control. These characteristics have the potential to enable their use in contamination-sensitive applications, including high-purity drying processes (e.g. air knives), next-generation FFUs and process gas circulation in ISO Class 1 mini-environments. However, their suitability for such applications requires quantitative particle emission data obtained under controlled operating conditions.

This work presents a comparative experimental study of particle shedding from mechanically supported and magnetically levitated fan technologies. A dedicated test bench was developed to perform reproducible particle emission measurements under ISO Class 1 conditions. Different fan bearing concepts, materials, rotational speeds, and volumetric flow rates were investigated using two particle measurement devices covering particle sizes from 10 nm and from 100 nm, respectively.

The results demonstrate that maglev fan technology exhibits particle emission compatible with ISO Class 1 requirements over a wide operating range. The presented methodology provides a robust framework for evaluating fan technologies and supports the qualification of maglev fans for future contamination-critical semiconductor air handling applications.

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