IEEE

SAN FRANCISCO BAY AREA
NANOTECHNOLOGY COUNCIL

14th Annual Fall Symposium

Nanomanufacturing – Latest and Cutting Edge Technologies

Dec 13, 2018: 9 am - 4 pm
SEMI Global Headquarters, Milpitas, CA

9:00 am	Registration, Coffee, Networking
9:50 am	Welcome by Nano Chair: Glenn Welcome by Symposium Chair: Vasuda
10:10 am	Enabling Self-Aligned Processes for Nanoscale Fabrication **Rudy Wojtecki, IBM, Research - Electronic Materials**
11:00 am	Selective Deposition: Progress &Z Challenges with an Emerging Tool for Continued Scaling **David Thompson, Applied Materials, Sr. Director, Center of Excellence in Chemistry**
11:50 am	Materials and Scaling Challenges in Crosspoint Memory **Karl Littau, Intermolecular, CTO**
12:35 pm	Lunch
1:35 pm	Quantum Dots: Manufacturing Nanomaterials at Consumer Scale **Martin Devenney, Nanosys, Sr. V. P of Manufacturing and COO**
2:25 pm	VividColor Nanoparticles for LED, MicroLED, OLED and LCD 2.0 applications **David Wyatt, PixelDisplay, CTO**
3:15 pm	Coffee and Networking
4:00 pm	Closing

Thanks to our sponsors: semi, EAG Laboratories, hp, IBM, Park Systems

Enabling Self-Aligned Processes for Nanoscale Fabrication

Continued scaling is driven in large part by the high-volume demand for mobile devices and increasingly by the internet of things. The future of nanomanufacturing will then require the maturation of the 7nm and 5nm technology nodes. The requirement for multiple patterning steps at these length scales introduces process variability as each patterning level requires alignment. This causes overlay errors, limits the pattern fidelity, and leads to critical dimension non-uniformity, all of which impact device performance. In order to extend scaling, self-aligned processes are required, where the formation of self-aligned structures on patterned substrates can eliminate a lithography step and reduce overlay error. In addition, AI hardware will need patterning and may resort to non-traditional semiconductor architectures such as 3D cross-point arrays. The ability to selectively deposit a material would then relax design rules and may enable future AI hardware as it requires different methods of fabrication. Selective area atomic layer deposition (SA-ALD) offers one method to enable self-aligned processes. Like resists for semiconductor patterning the broad applicability of SA-ALD requires specialized materials to broaden the number of ALD films that can be selectively deposited and minimize defectivity. The design of blocking materials that can be tailored to enable the selective deposition of Al2O3, TiO2 or ZnO will be discussed. In addition, these materials enabled the selective deposition on a prepatterned surfaces with critical dimensions as low as 15nm.

Dr. Rudi Wojtecki graduated from Case Western Reserve University in 2013 with a Ph.D. in Macromolecular Science & Engineering under the auspices of Stuart J. Rowan (now at the Univ. of Chicago) and the support of a NASA GSRP fellowship. Dr. Wojtecki joined IBM – Almaden Research Center after completion of his graduate work, as an engineer, and promoted to research staff member in 2015. He is author of 23 peer reviewed scientific publications including a Nature Materials Review article with nearly 800 citations. In 2017 he was recognized as an IBM Master Inventor for work highlighted in over 100 patent and patent applications. Dr. Wojtecki's current research efforts are geared to address the fabrication of superconducting qubits for quantum computers and ongoing challenges for lithographic materials used in the manufacturing of semiconductors.

Selective Deposition: Progress and Challenges with an Emerging Tool for Continued Scaling

Dr. David Thompson is Senior Director, Center of Excellence in Chemistry at Applied Materials. He leads a team of chemists at Applied Materials tasked with supporting the discovery and identification of chemistries for new differentiated tool offerings. He did his undergraduate studies in chemical engineering and received a Ph.D. in the organometallic chemistry of fullerenes and nanotubes. Both of these degrees were obtained at Queen's University in Kingston, Ontario, Canada. David has 56 granted US patents in semiconductor chemistry, process, and integration.

Materials and Scaling Challenges in Crosspoint Memory

Crosspoint memory technology has experienced a resurgence in recent years thanks in large part to the introduction of 3D XPoint from Intel/Micron. In principle, crosspoint memory can give the smallest cell architecture with memory cells at every intersection of bitline and wordline without the need for transistors at each cell location. However, in today's commercial non-volatile memory environment dominated by inexpensive NAND flash, even crosspoint memory will require massive 3D integration and/or significant scaling in order to be competitive. This introduces unique cell architecture and materials challenges. Following an overview of current crosspoint memory technology we give an introduction to how these challenges are being addressed and point toward possible future developments in non-volatile memory.

Dr. Karl Littau is a Physical Chemist and with expertise in thin film deposition, ALD, CVD, surface and gas phase chemistry, and solid state physics. He holds a BS in Chemistry from UC Berkeley and a PhD in Physical Chemistry from Stanford University. He has held positions at AT&T Bell Laboratories, Applied Materials, Inc., Xerox's Palo Alto Research Center, Stanford University, and is currently CTO at Intermolecular Inc. where Dr. Littau has been directing research and development of new materials and methods for advanced IC devices and emerging technologies.

Quantum Dots: Manufacturing Nanomaterials at Consumer Scale

Quantum Dots are perfecting LCD displays today, enabling a new generation of brighter, more efficient televisions with lifelike colors. This has given LCD technology an important edge as it battles new TV display entrants such as WOLED. This talk will provide an overview of Quantum Dot technology, how it works and where it is headed next. Topics include challenges of nanomaterials manufacturing scale-up, Quantum Dots' evolving use in LCD displays, as well as how they enhance and are being used in OLEDs and micro-LED displays, and how they are being developed as emitter materials for future printable electroluminescent displays.

Dr. Martin Devenney is Senior Vice President of Manufacturing and Chief Operating Officer at Nanosys. He leads manufacturing scale-up activities for Nanosys state-of-the-art Quantum Dot materials and components. Devenney has extensive experience bringing new technologies from the lab to commercial scale. Prior to Nanosys, Dr. Devenney drove the research, development and operations activities at Symyx and most recently at Calera. While at Symyx he did work on conventional LED phosphors as well as a variety of other materials, and worked extensively on both material development and scale up. Dr. Devenney received his PhD in Inorganic Chemistry from Queen's University Belfast. He has over 35 granted patents and more than 20 scientific publications.

VividColor Nanoparticles for LED, MicroLED, OLED and LCD 2.0 applications

Displays are going everywhere, in everything. The visual interface in SmartPhones, Laptops and TV's has already transformed our daily lives, becoming the visual border into our increasingly digital world. It's already become hard to imagine a world without displays, and in the last 5yrs applications of Quantum Dot Nanoparticles in displays have led to major advances in color gamut, one of the most important vectors of human vision. But in the other vectors of brightness, efficiency, robustness, environmental impact and lifetime, major hurdles still remain. This presentation begins with a recap of the challenges and opportunities for applications of Nanoparticles in Lighting and Displays, and then dives into future applications including the introduction of VividColor(tm) into MicroLED, OLED and LCD 2.0, and how to enable battery-hungry portable visual devices to last brighter, longer.

David Wyatt is the CTO of PixelDisplay, a company he co-founded in 2015. David is the inventor of PixelDisplay's VividColor™ HDR and NoBlue™ technologies that give system developers access to better display solutions based on LED, OLED and MicroLED. David originates from rural Australia, the country where he studied Electrical Engineering in South Brisbane College, and Bachelor Computer Science at University of Queensland, then followed his engineer passion for both hardware and software into entrepreneurism, to found his first Startup in Taiwan; learning Mandarin on the fly, before coming to the US through an acquisition. Prior to founding PixelDisplay, David was a Distinguished Engineer at NVIDIA, leading technology developments on GPU's, Tegra, and creating their Display Technology division. Before NVIDIA, David was a Chief Engineer, and Platform Architect at Intel for 8yrs; as well as leading efforts in Chips and Technologies, and Weitek. Now with over 20 years' experience in Silicon Valley, David's pioneering innovations have covered a wide range of disruptive technologies, such as variable display refresh, content-adaptive High Dynamic Range displays, high-speed wired/wireless links, intelligent touch-display chips, thinner lighter portable devices and more. David has over 200 patents filed internationally, with more than 90 issued in the US, across a wide variety of areas. David's IP has become an integral part of industry standards (including VESA, HDMI, HDCP and JEDEC), and key features on products including those from Apple, Google, Intel, Microsoft, NVIDIA, Lenovo, Sony, Xiaomi and many more.