



College of Liberal Arts and Sciences  
Fall 2021 Chemistry Seminar Series  
Friday, Oct. 15<sup>th</sup>

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## **Technology Trends and Challenges Driving Nano-Electronics Scaling**

### **Abstract:**

As multistep, multilayer processing in the semiconductor industry becomes much more complex, innovations in processing strategies and architecture designs while enhancing yield and reducing defects is critical to the continuation and success of the industry moving forward.

Basic Device Physics, IRDS Requirements/Expectations, and the driving force behind Transistor & Interconnects Research will be reviewed. Additionally, processing approaches to address complex applications in surface chemistry, selective etching, and patterning of high aspect ratio structures will be discussed.

Furthermore, part of the talk will focus on future device options and the process sensitivity of Nontraditional scaling to achieve challenging 3D architecture designs. This will include Gate pitch scaling, Gate-All-Around (GAA) by fabricating nanowires as transistor channel materials to enable the scaling evolution, Fin thinning to create Ultra-Thin-Body-Transistor, and increased mobility fins, III-V elements NMOS, Ge PMOS.

### **Bio:**

Nabil G. Mistkawi is a Senior Staff Engineer/Technologist at Samsung. He joined Samsung Austin Semiconductor CC (Cleans/CMP/ EP (Electro Plating)) LSI group in 2016. Since then, he has been leading innovations in chemical formulations and process technology development. He is also steering yield improvement, cost reduction projects, and filtration technology research efforts. Previously, he was at Intel where he joined in 1993 and was involved in the development of the first Pentium processor and all microprocessor generations that followed. Throughout his career he focused on path finding research efforts in the areas of diffusion, and wet, dry, and gas/vapor phase etching. His work spans from the fundamental materials research and development to the scaling and technology transfer to high volume manufacturing. He has earned numerous Samsung and Intel awards in innovations and process technology development used in various manufacturing processes and microprocessor products.

Dr. Mistkawi's innovations were recognized by President Obama in "Winning the Future" speech, Feb. 2011 in Hillsboro OR. He was the recipient of the Intel Achievement Award (Intel's highest technical award) for his work on nanowires transistor channel fabrication (Gate-All-Around) and contributions to the "Development and demonstration of scalable transistor architecture for 7nm and beyond", 2014. He was

the recipient of two “Global Environmental Awards” in 2005 & 2011 for “inventing environmentally friendly wet etch chemical formulations/processes”. He is an active member on the International Roadmap for Devices and Systems (IRDS). He was featured in the Sustainable Business Oregon Journal and other major newspapers and a documentary produced in 2012. He was also the Recipient of the 2018 president award and the “Inventor of the year award” at Samsung Semiconductor in 2018 and 2017.

Dr. Mistkawi received the prestigious “Innovation in Technology Award” for his achievements from the academic community for North America across all US and Canadian Universities, 2011. He is also the recipient of the “Outstanding Young Alumni Award” and “Paul Emmett Award” from Portland State University. Dr. Mistkawi was an invited member where he joined the White House Council for Jobs, Education, and Competitiveness”, 2012/2013.

Dr. Mistkawi earned his bachelor’s degree in chemistry and biochemistry from the University of Oregon, 1993. He received his master’s degree in electrical engineering from Oregon Graduate Institute, 2004 and doctoral degree in Physical Chemistry and Materials Science from Portland State University, Oregon, 2010. He holds 31 patents, author of several technical papers, and presented as keynote speaker in numerous conferences and events.