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SUNY Poly Professor Awarded \$2.1 Million by the Advanced Research Projects Agency-Energy (ARPA-E) for Collaborative Next-Gen Power Electronics Integrated Circuits R&D



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Fabrication of the Devices for High-Performance Energy Applications Will Use SUNY Poly's State-of-the-Art Capabilities and Support Students' Hands-on Education

ALBANY, NY – SUNY Polytechnic Institute (SUNY Poly) announced that Associate Professor of Nanoengineering Dr. Woongje Sung has received \$2,103,000 in total funding from the Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) as part of a collaborative research effort with teams from Ohio State University and North Carolina State University. Professor Sung aims to develop Scalable, Manufacturable, and Robust Technology (SMART) for Silicon Carbide (SiC) Power Integrated Circuits (SMART SiC Power ICs) that open the door to robust switching capabilities in a range of high-performance energy applications, including automotive and industrial, as well as for electronic data processing and energy harvesting.

The three-year grant will help to enable the development of highly scalable, manufacturable, and resilient SiC power integrated circuits and support devices. This will include the establishment of a novel manufacturing process, in addition to demonstrating the devices' functionality, by leveraging SUNY Poly's world-class innovation-focused capabilities, including its advanced cleanrooms to support further progress.

“On behalf of SUNY Poly, I am proud to congratulate Professor Sung for receiving this funding from the ARPA-E to improve the scalability and manufacturability of SiC power integrated circuits through the use of this institution’s high-tech academic and research ecosystem, comprised of the tools and know-how that are a unique driver of SUNY Poly’s ability to continually advance the applications that play an important role in our daily lives,” said SUNY Poly Interim President Dr. Grace Wang. “This award is yet another example of the incredible talent of SUNY Poly’s faculty and their wide-ranging, impactful research.”

Notably, two SUNY Poly graduate students will be supported by this project, and, along with a number of undergraduate students, they will be able to gain first-hand design experience by utilizing computer simulations to optimize the devices, review the fabrication process, and document the project’s results.

“Our faculty members have incredible knowledge in exciting and topical areas, and I am excited to congratulate Dr. Sung on this latest research award. In addition, this research will help to enable the types of experiential learning opportunities for a number of our students that will complement their academic knowledge so as to provide them with a well-rounded, highly relevant education that will help them to find career success,” said SUNY Poly Interim Provost Dr. Steven Schneider.

“As I offer my congratulations to Dr. Sung for this collaborative grant, it is exciting to note the potential that this research has to decrease energy consumption while enabling more robust power electronics applications,” said SUNY Poly Interim Dean of the College of Nanoscale Science and Engineering Dr. André Melendez. “This award showcases the talent and dedication of our faculty who are catalyzing progress in a number of semiconductor-based knowledge areas through the use of SUNY Poly’s state-of-the-art facilities and capabilities, and we look forward to continuing the types of research that can be meaningful to our society.”

“I am proud that the SMART SiC Power ICs we are developing at SUNY Polytechnic Institute are being recognized for their potential to lead to more cost-effective manufacturing processes for critical devices, and I thank ARPA-E for the support of this R&D effort,” said Dr. Sung. “Working in collaboration with researchers at Ohio State University and North Carolina State University as part of this overall grant, I look forward to advancing these technologies while providing students with the opportunity to learn about the challenges and pursue the pathways forward to power next-gen industrial and automotive applications with our implemented solutions.”

Dr. Sung’s collaborative grant is one of 40 new projects that were approved for \$98 million in total funding as part of the U.S. Department of Energy’s OPEN 2018, ARPA-E’s open funding opportunity. These funds support some of America’s top energy innovators’ R&D projects as they seek to develop technologies to transform the nation’s energy system. The selected OPEN 2018 projects are located in 21 states and fall into 9 technical categories, including transportation, electricity generation and delivery, and energy efficiency. Of those selected, approximately 43% of OPEN 2018 projects are led by universities, 35% by small businesses, and the remainder by large businesses, non-profit organizations, or federally funded research and

development centers (FFRDCs). To view the complete list of selected projects, please follow the following link: <https://arpa-e.energy.gov/?q=document/open-2018-project-descriptions>.

In addition, Dr. Sung also recently received a separate grant for \$30,000 to collaborate with NISSIN Ion Equipment on the project entitled, “High temperature implanted 4H-SiC JBS diodes.” In this project, Dr. Sung and his SUNY Poly research team will design, fabricate, and characterize SiC Junction Barrier Schottky (JBS) diodes, which are capable of handling higher voltages with less current leakage, with the ability to enable switching at higher temperatures than silicon-based diodes. During fabrication, NISSIN Ion Equipment will conduct the high temperature ion implantation processes, providing the resultant information to their potential customers.