Power Electronics Campaign

The New York State Center for Advanced Technology in Nanoelectronics and Nanomaterials (CATN2) Matching Investment Program (MIP)

The CATN2 completed six competitive funding rounds under the CATN2 Matching Investment Program (MIP) to support faculty-led projects and expand SUNY Poly's R&D and commercialization capabilities in collaboration with New York State-based companies. Total awards under this program have totaled $1,431,787, with industry and other partners providing $5,273,038 in additional resource commitments for a total program investment of $7,165,825 to date resulting in a 5 to 1 match.

The faculty-led, industry driven research projects at SUNY Poly's College of Nanoscale Science and Engineering have focused on areas in the power electronics have totaled $900,000 with $600,000 being funded by NYS companies. The following projects that support the CATN2's power electronics campaign in the area of Power Packaging, including principal investigators, total project budget, New York industry partner, and summary of the research to be undertaken:

Project Title: Discrete Power Packaging and Dynamic Characterization of WBG Power Devices Using Advanced Packaging Materials
NY-PEMC Campaign Thrust: Power Packaging
PI: Adam Morgan with Woongje Sung
MIP Award: $100,000
Total Project Budget: $300,000
Private Entity Partner(s): Indium Corporation
Summary:
Power semiconductor technology is enabling electrification across a wide range of applications, from transportation to power generation. At the heart of this technology advancement, wide-bandgap (WBG) power semiconductors, SiC and GaN, are replacing their Si counterparts as the power device of choice at higher power levels. Consequently, power conversion systems (PCS),

within the transportation sector, for example, benefit from power electronics composed of packaged WBG devices, such as SiC JBS diodes and MOSFETs or GaN HEMTs.

In order for WBG-based power electronics to harness the full power conversion capability of the WBG semi, in terms of operating temperatures and system voltages, the surrounding packaging materials and power electronic components also must be rated for the same, if not higher, operating conditions. In collaboration with Indium Corp., this project will address the critical missing RD&D capability at SUNY Poly by developing (1) WBG power packaging design and fabrication processes, (2) HV double-pulse test (DPT) setup, and (3) power cycling test setup, where the RD&D flow for WBG power devices and power packaging.

Impact:

- Provide discrete device packaging capability/partnership within SUNY Poly ecosystem that enables full power testing of WBG devices needed for complete RD&D of the technology
- Establishes a power electronics test platform for other researchers at SUNY Poly, Indium, other institutions and companies
- Allows sharing/comparing of test data between SUNY Poly, Indium and other institutions or companies that accelerates development and commercialization of WBG devices and packaging materials to meet growing power electronics demand and could result in new revenue stream
- Develops novel advanced power packaging to meet the requirements of the next-generation of WBG devices