Guest Editorial Special Issue: Ultra Wide Band Gap Semiconductors for Power Control and Conversion

ON BEHALF of myself and my fellow Guest Editors for the Special Issue on Ultra Wide Band Gap Semiconductors for Power Control and Conversion appearing in this month's issue of the IEEE TRANSACTIONS ON ELECTRON DEVICES, we are gratified to be able to present readers with a selection of papers spanning the current state of the art in wide and ultrawidebandgap semiconductor devices. Electronics for power control and conversion is presently going through a renaissance, with new device concepts, extensions of known concepts to new materials, and new applications all merging simultaneously. Fundamental material-level work in Ga_2O_3, diamond, Al(Ga)N, and other ultrawidebandgap materials have begun to produce device results commensurate with the fundamental advantages that these materials promise for power control and conversion applications. At the same time, the understanding and performance of devices based on SiC and GaN continue to improve. Applications of these new materials and devices include automotive, data center power management, grid control, industrial and locomotive traction control, and others. Despite the tremendous progress in this area, however, much remains to be understood. The role of intrinsic and extrinsic defects in these materials on device performance, optimal strategies for device design and fabrication, surface passivation, and dielectric materials suitable for the high electric fields supported by these materials, device structures, and concepts for achieving the best possible electrical performance, appropriate approaches to thermal management, and the potential and challenges of integration of these devices with other semiconductors for system implementation are all areas in which rapid progress is being made.

This Special Issue features papers highlighting recent developments and the state of the art in the field of ultrawidebandgap semiconductors and devices for power control and conversion, including both experimental results and theoretical developments. Coverage includes advances in the material-level understanding of key materials for power devices, including Ga_2O_3, AlN, GaN, AlGaN, and diamond; device demonstrations and performance improvements through both material and device design innovations spanning these materials; novel device architectures to maximize the performance of devices and circuits for power applications; as well as advances in device performance and modeling of SiC and GaN devices for on power control and conversion applications.

My co-editors and I hope that you will enjoy reading this selection of papers as much as we have.

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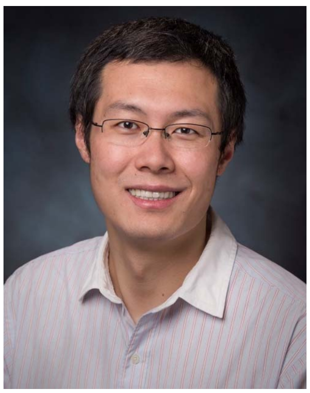

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Matteo Meneghini received the Ph.D. degree in electronic and telecommunication engineering from the University of Padova, Padua, Italy, working on the optimization of GaN-based LED and laser structures.

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Dr. Tiku has served on the CS MANTECH Technical Committee for over ten years and the Executive Committee as a University Liaison. He has authored or coauthored over 20 patents. He is the author of the book *III-V Integrated Circuit Fabrication Technology* (Pan Stanford/CRC Books).