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Solid-state lighting has advanced significantly in the past decade, and recent advances in both organic and inorganic light-emitting diodes (LEDs) have enabled the penetration of these technologies into consumer electronics, display, and energy-efficiency applications. Significant progresses in organic LEDs and III-Nitride LEDs have been incorporated in portable displays, flexible displays, television backlighting, and automobile industries. The next-generation advances for both LED technologies are expected to address the general illumination, which accounts for more than 22% of the total electricity consumption. In order to address the technological barriers in both OLEDs and III-Nitride LEDs applicable for solid-state lighting, advances in all aspects of physics, materials, and engineering of these device technologies and systems are required.

Progress in III-Nitride LEDs requires innovations in devices and concepts for achieving high internal quantum efficiency, low-cost methods for light extraction, and new materials and devices to address the droop issue in LEDs. The importance of new approaches for addressing the droop issue has resulted in numerous breakthrough ideas as follows: 1) new active materials with low Auger rate, and 2) laser-based solid-state lighting. The pursuit of red emitters in III-Nitride systems is gaining prominence due to its potential importance for integration in white LEDs. The packaging and system-level implementations of III-Nitride devices beyond general illumination applications are of growing importance, specifically for intelligent-based lighting, power electronics, and sensors technologies.

In the area of organic LEDs, several important research topics include the pursuit for novel concepts in light extraction, and novel emitters and host/charge transporters for organic LEDs. Understanding of the reliability issues limiting organic LEDs is of great importance, and the pursuit of new approaches for achieving white light emission in these systems remains crucial. In addition, novel device architecture for organic LEDs and flexible LEDs, as well as solution-processed OLEDs, will be actively pursued.

The areas of interests covered in this special section represent small subsets of the important topics covered in the field of solid-state lighting. This exciting research area represents a growing field for addressing the issues stated above.

Nelson Tansu is the Daniel E. '39 and Patricia M. Smith Endowed Chair Professor in photonics and nanoelectronics at Lehigh University, where he is presently the director for the Center for Photonics and Nanoelectronics. His research interests lie in the physics of semiconductor optoelectronics materials and devices, low-dimensional semiconductor nanostructures, and III-nitride and III-V-nitride semiconductor optoelectronics devices on GaAs, InP, and GaN substrates. He received his BS and PhD degrees in electrical engineering/applied physics from the University of Wisconsin-Madison in 1998 and 2003, respectively.

Franky So received his PhD in electrical engineering from the University of Southern California. From 1993 to 2005, he was with Motorola and OSRAM before he moved to the University of Florida as a professor in the Materials Science and Engineering (MSE) Department. In 2015, he joined North Carolina State University as the Walter and Ida Freeman distinguished professor in the MSE Department. His research interest is in the area of organic electronics.

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