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SPECIAL ISSUE ON SOLID-STATE LIGHTING TECHNOLOGY

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Guest Editorial

LIGHTING consumes an enormous amount of energy. In 2001, 22% of the US electricity was used for lighting. The cost of this energy to consumers was roughly $50 billion per year or approximately $200 per year for every person. The cost of this energy to the environment was approximately 130 million tons of carbon emitted into the atmosphere. The increase in energy consumption and the growing threat to the earth's climate demand substantial increases in lighting efficiency.

Today, there is plenty of room for improvement in lighting efficiency. For example, incandescent lamps, which are the major source of lighting, are extremely inefficient. Typical incandescent lamps convert only about 5% of the energy into visible light suitable for lighting and 95% of the energy is wasted as heat. While fluorescent lamps are more efficient, with conversion efficiency of 20%–25%, they are not desirable in residential lighting because of their poor color-rendering index (CRI). A more efficient lighting technology with high CRI is needed for the 21st Century to reduce pollution and greenhouse gases.

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Solid-state lighting (SSL) is the direct conversion of electricity to visible light using organic or inorganic semiconductor materials and has the potential to provide substantial enhancement in lighting efficiency compared to existing technologies. In this JDT/JSTQE issue, we present a total of 17 invited and contributed papers on key aspects of SSL technology. The topics covered include organic light emitting diodes, high brightness GaN-based LEDs, device physics and processing, inorganic phosphors, techniques for improved light extraction, description of the next generation lighting initiative of the U.S. Department of Energy.

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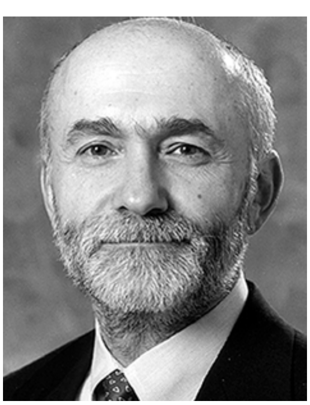
After his graduation in 1991, he was a research scientist at Hoechst Celanese Research Division working on high speed polymer electro-optical modulators. In 1993, he joined the Motorola Phoenix Corporate Laboratories and became a Program Manager responsible for the OLED technology development In 2001, he joined OSRAM Opto-Semiconductors and became the Head of OLED Materials and Devices Research. In 2005, he joined the faculty in the Department of Materials Science and Engineering at the University of Florida. He is now currently an Associate Professor in the Department. Dr. So holds more than 50 issued patents.



Andrew J. Steckl (S'70-M'73-SM'79-F'99) received the B.S.E. degree in electrical engineering from Princeton University, Princeton, NJ, in 1968, and the M.Sc. and Ph.D. degrees from the University of Rochester, Rochester, NY, in 1970 and 1973, respectively.

In 1972, he joined the Honeywell Radiation Center, Lexington, MA, as a Senior Research Engineer, where he worked on new concepts and devices in the area of infrared detection. In 1973, he joined the Technical Staff of the Electronics Research Division of Rockwell International, Anaheim, CA. At Rockwell he was primarily involved in research on charge coupled devices. In 1976, he joined the Electrical, Computer and Systems Engineering Department at Rensselaer Polytechnic Institute in Troy, NY, where he developed a research program in microfabrication of Si devices. In 1981, he founded the Center for Integrated Electronics, a multi-disciplinary academic center focused on VLSI research and teaching, and served as its director until 1986. In 1988, he joined the Electrical and Computer Engineering Department of the University of Cincinnati as Ohio Eminent Scholar and Gieringer Professor of Solid State Microelectronics. At Cincinnati he has built the Nanoelectronics Laboratory in the general area of semiconductor materials and devices for photonics. His current activities include rare-earth-doped GaN MBE growth and luminescent devices, organic and biomolecular devices, hybrid inorganic/organic materials and devices for flat panel displays and solid-state lighting. His research has resulted in over 350 publications and over 400 conference and seminar presentations.