

Solid-state lighting promises to transform the way we light the world.

That promise is found in solid-state lighting's ability to save energy, reduce maintenance and change our entire lighting infrastructure. The light-emitting diode (LED), the primary solid-state lighting technology, has been tapped by scientists, government agencies and energy-efficiency organizations as the next-generation light source for general illumination in homes, offices and outdoor environments.

Much work is needed, however, before we reach the pinnacle of this lighting transformation. The Lighting Research Center's Solid-State Lighting Program conducts research and education needed to help this technology overcome some of the barriers it currently faces in gaining widespread acceptance. The LRC's multidisciplinary team is focusing its efforts in several key areas, ranging from basic lab science to field applications research.

LED Package and Lighting Systems Research

Successful solid-state lighting depends not only on the performance of individual components, but also on the integration of those components and how the entire system performs. Poor integration can lead to poor light quality and premature failure of LED-based lighting systems. The LRC is analyzing interactions between LED chips, phosphors, encapsulation materials, optics, heat sinks, drivers and luminaire housing. The LRC also is working on new ways to design LED systems for better light output and color, higher luminous efficacy and longer life. The goal is to optimize integrated system performance so that solid-state lighting systems ultimately live up to their promises.

Applications Demonstration

Although solid-state lighting technology may not yet be ready for widespread general lighting use, each incremental improvement in its development opens doors to more applications where it can replace less efficient light sources. The LRC is identifying and evaluating innovative ways to use LEDs in architectural lighting applications. The LRC conducts field demonstrations and case studies to show where this technology can offer significant benefit compared with traditional lighting technologies and to develop best practices for applying solid-state lighting.

Human Factors Study

For solid-state lighting to gain acceptance, it must meet people's expectations and needs. LRC scientists conduct psychophysical and physiological research to understand how people perceive and react to different lighting conditions. The effects of spectrum, intensity, and spatial and temporal distribution are studied to determine the optimum characteristics of a solid-state lighting system.



Education

Education plays an important role in solid-state lighting gaining acceptance for general illumination. As users better understand the strengths and weaknesses of this rapidly evolving technology, successful solid-state lighting applications will grow. The LRC conducts seminars and workshops to educate and train lighting fixture designers and manufacturers, lighting specifiers, architects and other professionals interested in learning more about LEDs and solid-state lighting.

Industry Collaboration

The Alliance for Solid-State Illumination Systems and Technologies (ASSIST) was established in 2002 by the Lighting Research Center as a collaboration between researchers, manufacturers, and government organizations. ASSIST's mission is to enable the broad adoption of solid-state lighting by providing factual information based on applied research and by visualizing future applications. On behalf of ASSIST, the LRC conducts research, demonstration and educational activities. Sponsors include Acuity, Amerlux, Bridgelux, China Solid State Lighting Alliance, Cirrus Logic, Cree, Everlight, FAA, GE Lighting Solutions, ITRI—Industrial Technology Research Institute, Intematix, LG Electronics, LG Innotek, Lighting Science Group, Lite-On, NeoPac Lighting, NYSERDA, OSRAM Sylvania/OSRAM Opto Semiconductors, Philips, POSCO LED, Seoul Semiconductor, Sharp, U.S. EPA, WAC Lighting, and WattStopper.

About the Lighting Research Center

Rensselaer's Lighting Research Center is the world's leading university-based research and educational institution devoted to lighting. Based in Troy, New York, the LRC's staff of more than 30 lighting experts is working to advance the effective use of lighting to create a legacy of positive change for society and the environment. The multidisciplinary team includes physicists, architects, engineers, designers, psychologists, biophysicists and communications specialists. Since 1988, the LRC has collaborated with industry, government, academia and public advocacy groups to make a positive impact on lighting manufacturing, design, specification, installation and use through research, application, education and market transformation. LRC facilities include a fully equipped photometry laboratory, climate-controlled lamp and electrical testing laboratories, a human factors laboratory, and an engineering workshop to produce fully functional prototypes and models.

For More Information

Visit the LRC Solid-State Lighting Program Web site for details on research projects, publications, ASSIST and other activities: www.lrc.rpi.edu/programs/solidstate

For more information about project sponsorship or the ASSIST program, contact:
N. Narendran, Ph.D., LRC Director of Research
tel: (518) 687-7100 e-mail: narenn2@rpi.edu

**Lighting
Research Center**

