Standards Set for Energy-Conserving LED Lighting

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These solid-state lights are powered by energy-efficient light emitting diodes and are among the first ones of a new generation expected to cut energy needed for lighting by 50 percent by 2027. Credit: NIST

Scientists at the National Institute of Standards and Technology (NIST), in cooperation with national standards organizations, have taken the lead in developing the first two standards for solid-state lighting in the United States. This new generation lighting technology uses light-emitting diodes (LEDs) instead of incandescent filaments or fluorescent tubes to produce illumination that cuts energy consumption significantly.

Standards are important to ensure that products will have high quality and their performance will be specified uniformly for commerce and trade. These standards—the most recent of which published last month—detail the color specifications of LED lamps and LED light fixtures, and the test methods that manufacturers should use when testing these solid-state lighting products for total light output, energy consumption and chromaticity, or color quality.

Solid-state lighting is expected to significantly reduce the amount of energy needed for general lighting, including residential, commercial and street lighting. “Lighting,” explains NIST scientist Yoshi Ohno, “uses 22 percent of the electricity and 8 percent of the total energy spent in the country, so the energy savings in lighting will have a huge impact.”

Solid-state lighting is expected to be twice as energy efficient as fluorescent lamps and 10 times more efficient than incandescent lamps, although the current products are still at their early stages. Ohno chaired the task groups that developed these new standards.

In addition to saving energy, the new lighting, if designed appropriately, can produce better color rendering—how colors of objects look under the illumination—than fluorescent lamps or even incandescent lamps, Ohno says.

NIST is working with the U.S. Department of Energy (DOE) to support its goal of developing and introducing solid-state lighting to reduce energy consumption for lighting by 50 percent by the year 2025. The department predicts that phasing in solid-state lighting over the next 20 years could save more than $280 billion in 2007 dollars.

The Illuminating Engineering Society of North America (IESNA) published a documentary standard LM-79, which describes the methods for testing solid-state lighting products for their light output (lumens), energy efficiency (lumens per watt) and chromaticity. Details include the environmental conditions for the tests, how to operate and stabilize the LED sources for testing and methods of measurement and types of instruments to be used.

“More standards are needed, and this will be the foundation for all solid-state lighting standards,” Ohno says. The standard is available from the IESNA.

The solid-state lights being studied are intended for

general illumination, but white lights used today vary greatly in chromaticity, or specific shade of white. The American National Standards Institute (ANSI) published the standard C78.377-2008, which specifies the recommended color ranges for solid-state lighting products using cool to warm white LEDs with various correlated color temperatures. The standard may be downloaded from ANSI's Web site. www.nema.org/stds/ANSI-ANSLG-C78-377.cfm

DOE is launching the Energy Star program for solid-state lighting products this fall. NIST scientists assisted DOE by providing research, technical details and comments for the Energy Star specifications. The Energy Star certification assures consumers that products save energy and are high quality and also serves as an incentive for manufacturers to provide energy-saving products for consumers.

The solid-state lighting community is continuing to develop LED lighting standards for rating LED lamp lifetime and for measuring the performance of the individual high-power LED chips and arrays. NIST scientists are taking active roles in these continuing efforts.

Source: NIST