



SOLID STATE LIGHTING STANDARDIZATION IN CHINA

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Chinese Solid State Lighting (SSL) industry develops rapidly in recent years as well as the standardization of this industry because of the special promotion from the government. Under the coordination of CSA, China has drafted a huge standards system for SSL. The standards are not only focusing on products but also fundament such as terminology and measurement methods. More than 10 national SSL standards are ready to be issued and more are under drafting. This paper gives general information on SSL industry and standardization in China, and some focused technical points and their solutions in the drafted standards.

SSL in China

In 2003, the Ministry of Science and Technology (MOST) of China proposed "National Solid State Lighting Program"^[1]. Promote by this program, China now become one of most active areas on SSL industry today, and has established relatively complete R&D and industry chain from epitaxy, chip, packaging to integral application. By the end of 2007, there are over 2200 enterprises on SSL in China, in which packaging & application enterprises occupy approx. 90%^[2].

General information of SSL standardization in china

The SSL standardization is considered to be a key project in China. The government as well as other organizations pay close attention to it, the related works were deposited, and some achievements have achieved by now. Details will be given in full paper.

In China, standards are administrated by Standardization Administration of China (SAC), and prepared and revised by related technical committees and organizations.

1. Standardization Committee of CSA

Possessing 116 members including domestic leading SSL enterprises, R&D institutes and universities, China Solid State Lighting Alliance (CSA) provides large platforms for the communication among the members, and between government and the whole SSL industry, and it also engages communication between domestic and oversea industry.

To accelerate and harmonize the standards setting up, CSA established Standardization Committee. Under the coordination of the committee, an integrated SSL standard system has been drafted, many standards important for SSL are about to be issued and more are under drafting.

2. SAC/TC224

National Technical Committee 224 of SAC (SAC/TC224) is a main technical committee who responsible for national standards for the lighting industry. For SSL, SAC/TC224 prepares standards for application and related products, such as packaged LEDs, LED modules and luminaries, and etc. The 12 SSL standards expected to be issued in early 2009 by SAC/TC224 are:

"Measurement Methods of LED Modules for General Lighting",
"LED Modules for General Lighting - Performance Requirements",
"LED Modules for General Lighting - Safety Requirements",
"LEDs for General Lighting - Performance Requirements",
"Self-ballasted LED lamps for general lighting services - performance requirements",
"Self-ballasted LED-lamps for General Lighting Services >50V Safety Requirements",
"LED Lamps For Road Lighting",
"LED Lamps For decorativ Lighting",
"Lamp Controlgear - Part 2-13: Particular Requirements for DC or AC Supplied Electronic Controlgear for LED Modules"
"DC or AC Supplied Electronic Control Gear for LED Modules - Performance Requirements"
"Terms and Definitions of LEDs and LED Modules for General Lighting"
"Miscellaneous lampholders - Part2-2: Particular Requirements - Connectros for LED Modules"

As modules are the basis of SSL solution, the scope of "Measurement Methods of LED Modules for General Lighting" can expend to LEDs and other LED products, and this drafted standard is quoted by other ones.

3. SSL Standardization Working Group of MIIT

SSL Standardization Working Group of Ministry of Industry and Information Technology (MIIT) mainly prepares ministry standards for LED epitaxy, chips, and several application products, etc. Now it has 7 standards under discussion which also expected to be issued in 2009.

4. SAC/TC229

National Technical Committee 229 on Rear Earth of SAC (SAC/TC229) is preparing a series of standards "Rear Earth Yellow Phosphor for White LED Lamps", which comprises a product standard and several standards on measurement method".

Focused technical points and solutions in SSL standards (submission version)

LEDs provide challenges not only to the lighting community but also to the light metric professionals^[3]. So that, standards on characterising & measurement of SSL products are posed at important positions. The challenges are caused by the characters of LEDs and SSL products, for example, they are sensitivity to temperature^[4], usually narrow beam angled, and their spatial colour non- uniformity ^[5] and etc.. Some focused technical points in the preparing of the standards and their solutions are described below, and more will be discussed in full paper.

1. Measurement of Luminous Flux and Luminous Intensity distribution

As above described characters, absolute measurement is required for SSL products.

In "Measurement Methods of LED Modules for General Lighting (draft)", deriving the luminous flux from illuminance distribution is recommend as the reference method for it suited best for this item^[6], however, the methods of applying integrating sphere systems and intensity distribution integrating are also specified in the standard.

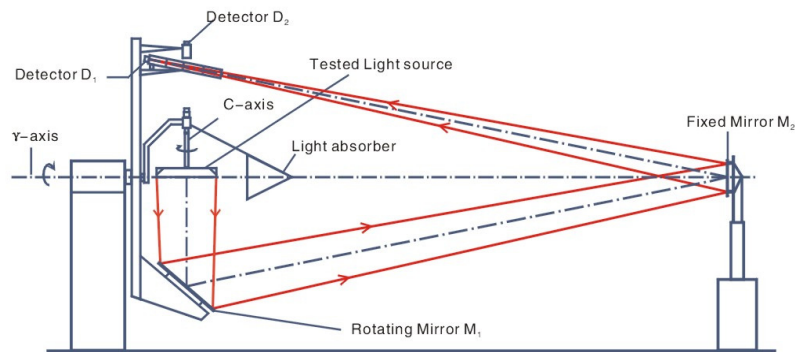


Fig.2: structure sketch of 2M2D goniophotometer

For luminous intensity distribution, several types of goniophotometers are analyzed in the standard, the temperature stability of tested sample is considered as a key factor. The 2M2D type as shown in fig. 2 is one been recommended. It keeps SSL products stable, and can realize both near and far field measurement for different samples with high angle accuracy. And Detector D_2 can measure luminous flux with the recommend method.

2. Colorimetric Quantities

To character the spatial color non- uniformity of LEDs and SSL products, "Measurement Methods of LED Modules for General Lighting (draft)" proposes two items:

averaged color nonuniformity: difference between the average color of all light from the SSL product and the color of the light at its reference axis direction;

maximum color nonuniformity: maximum color difference between the light emitted at any direction in half-peak beam angle and the light at the reference axis direction.

In the standard, the two quantities as well as averaged color performance are recommended to be measured by goniospectroradiometers [7] which consists of a goniophotometer (without photometer) and a high accuracy array spectroradiometer, as shown in fig. 3.

Integrating spectroradiometers can only measures averaged color quantities relatively.

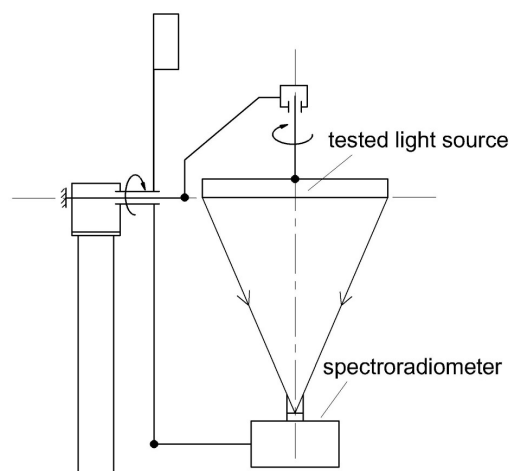


Fig.3: structure sketch of goniospectroradiometer

3. Thermal Resistance of LEDs

Generally, thermal resistance is defined as the ratio of temperature difference between the junction and specific point to the power dissipated for heat. For LEDs, however, part of consumed power is transformed to light radiation, and it is difficult to evaluate how much

power transformed to light radiation or heat exactly. Beside, the specific point is also important for it determines the evaluation item and measurement method.

In "LEDs For General Lighting-Performance Requirements (draft)", a "reference thermal resistance" is defined which is expressed as:

$$\theta'_{JK} = \left[\frac{T_J - T_K}{P_{LED}} \right] \dots\dots\dots(1)$$

Wherein, θ'_{JK} is the reference thermal resistance, T_J is the junction temperature, T_K is the temperature of case (or main dissipating device) of LEDs when it is connect to an infinite heat sinker, and P_{LED} is the total power consumption, all the values are specified in rated current and ambient temperature.

The measurement of reference thermal resistance is rather simple by applying electrical pulse with the following waveform [8]:

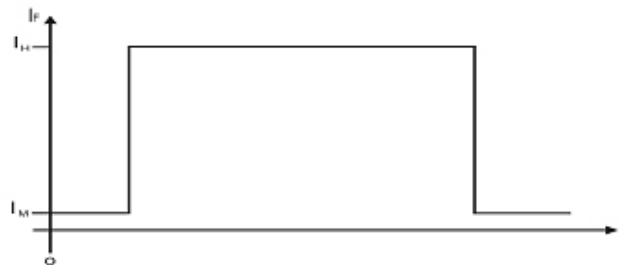


Fig. 1: measurement waveform for reference thermal resistance

Further work on ssl standardization in china

As introduced, China has obtained primary development in SSL standardization, however, it is far away from serving the industry well.

There are many other standards under draft or on schedule for the industries which have developed to certain scales. All the standards are kept open to be revised to adapt to the fast development of SSL technology. Meanwhile, the application and improvement of these standards are considered to be even more important in further work.

The latest international development is very significant to the SSL standardization in China, close attentions will continue to be paid, and further, China will take part in more international communication, hopes to give more independent contribution to the world's SSL standardization.

In 2008, SAC/TC224/SC3, subcommittee on light and radiation measurement was established, it responses for the domestic standardization in the field corresponding to CIE D2. As CIE D2 attaches importance to SSL standards, SAC/TC224/SC3 is proposing to set several research groups to engage the similar standardization work as the TCs of CIE D2.

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