QUALITY OF LIGHT: BRIGHTER WHITES

SORAA®
Simply Perfect Light™

An often overlooked characteristic of light sources is their ability to render white, which is arguably as important as color rendering. Most white-colored manufactured products include optical brighteners, also known as fluorescent whitening agents (FWAs), which are designed to pick up short-wavelength light (UV and violet) and re-emit it as longer-wavelength visible light (Figure C). The effect is an increase in bluish tint as well as an increase in reflected brightness, both of which serve to make such whites "whiter". Optical brighteners have been developed over decades and are included in a wide range of materials, including clothing, cosmetics, plastics, detergents, and paper. These brighteners are excited by conventional light sources such as daylight or incandescent lamps, and they contribute to our everyday experience of white perception. Despite the ubiquity of white objects in our lives, Whiteness Rendering is not captured by standard measures of light quality, such as the Color Rendering Index (CRI).

Conventional (blue-based) LEDs cannot render such white materials properly because they lack emission of short-wavelength light that is necessary to excite the FWAs. The result is that these white materials look yellow and dingy under conventional LED lighting (Figures A and B). This is a fundamental flaw in conventional LEDs, and even those with a very high CRI fail at rendering whiteness properly.

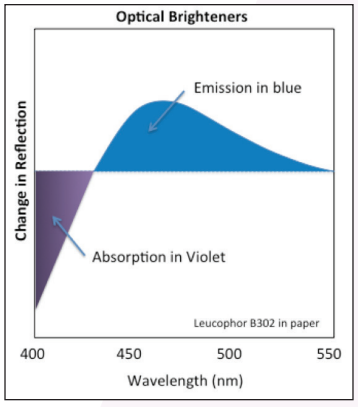
Soraa's GaN-on-GaN technology is engineered to render white materials with optical brighteners in exactly the same way as natural incandescence. Excitation of brighteners is provided by violet light, rather than harmful ultraviolet light. The result is a bright, white appearance optimal for modern-day clothing, cosmetics, paper products, and appliances.

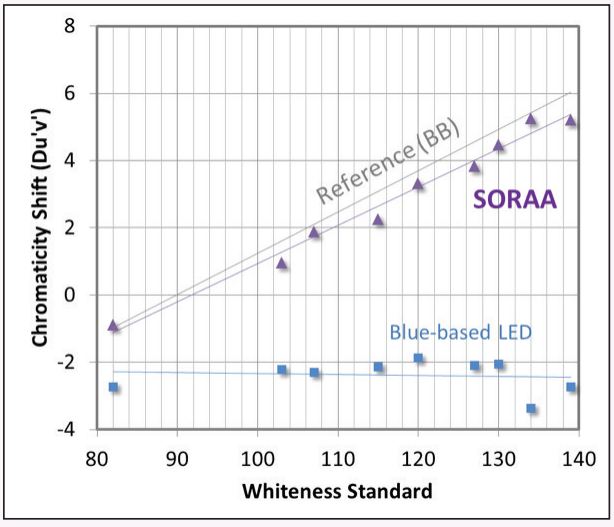
This was done by calculating the chromaticity shift of Whiteness Standards illuminated by a reference illuminant (e.g., 3000K blackbody emission). The slope of the chromaticity shift as a function of the whiteness of the Standards (as specified by CIE) was then assigned a value of 100 for the reference illuminant. The Soraa lamp emission spectrum was designed to match that slope (Figure D). For blue-based LEDs, there is no chromaticity shift (no whiteness) effect, and the slope is zero.

White Accuracy can be quantified by measuring the reflected chromaticity of white materials under natural incandescent illumination and comparing it to the case of LED illumination. As Figure E shows, the error in whiteness accuracy can be many SDCMs using conventional LEDs, whereas in Soraa's case, the accuracy has been engineered to be within one SDCM.

Together with the outstanding color rendering of Soraa's perfect spectrum technology, this unique ability at white rendering results in a simply perfect light source - the only LED source truly able to render all objects in a pleasant and natural fashion.

Figure A (top): White materials appear yellow and dingy when illuminated by other LED lamps (left). SORAA VIVID 95 CRI/95 R9 lamps (right) bring out the bright white properly.
Figure B (above): Colors are more saturated and glowing against whiter whites, as shown in the example at right, illuminated by SORAA VIVID 95 CRI/95 R9 lamps. Other LED lamps (left) give colors and whites a less appealing appearance.





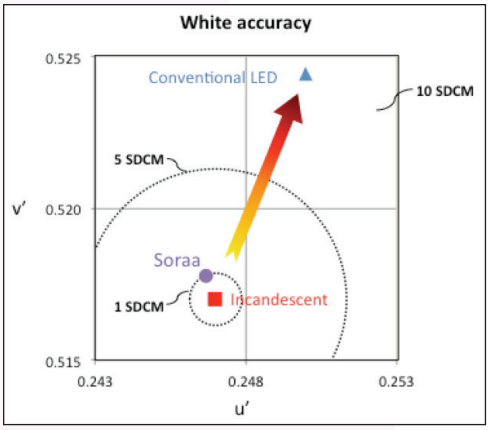


Figure C (above): How optical brighteners work.
Figure D (left): Whiteness standards relative to the black body curve.
Figure E (far right): White accuracy metrics.

SORAA®
Soraa Inc.
6500 Kaiser Drive
Fremont, CA 94555
855 GO-SORAA
855 467-6722
www.soraa.com

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