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Color - Why Not the Best?

Terry K. McGowan, FIES
Director of Technology and Engineering

Last December, I asked you a question via this column, "How Important is Color in Residential Lighting?" (You can review that column by clicking here.)

Several of you responded and confirmed that you also thought color was "important" or "very important." One person, however, felt that I should have made a stronger statement and said, "You don't get it. Color, and particularly the color provided by incandescent bulbs, is the heart of residential lighting."

The ALA strongly supports the idea of "quality of light," of course; so I've been thinking about how we might raise the color quality of energy-efficient CFL and LED bulbs. It seems to me that the closer we can come to replicating the color quality of incandescent bulbs, the greater the consumer acceptance of such bulbs will be.

Technically, that means increasing the Color Rendering Index (CRI) of such bulbs from 80+, which is typical today, to more than 90. The lamp and luminaire manufacturers have the technology to do that and products - residential downlights, for example - have been on the market for several years now with CRI ratings of 90 and higher. Such products are successful. LED downlights are a "sweet spot" in the market. But, the CRI of all clear and frosted incandescent bulbs is 99 to 100. Why not shoot for that?

There are two reasons according to bulb manufacturers: The first is cost. Better color rendering from CFL or LED light sources requires more of those "rare-earth" phosphors that you have probably been hearing about. They are well-named because the supply is indeed limited and China, which is the major world supply source as well as a major user, is restricting their export prompting substantial price increases. Second, the phosphor technology being used currently in both CFLs and LEDs results in lower source efficacy (lumens/watt) as CRI increases. The difference is about 3 to 5 percent, but that's enough to be of concern to those who want to minimize lighting energy use. Energy Star requirements, for example, including those in the new Luminaires V1.0 which go into effect next year, continue to call for a minimum CRI of 80.

My view, however, is that scaling back a bit on lumens per watt to get better color and greater acceptance of high-efficacy sources will save more energy sooner because it will move consumers to retrofit their existing incandescent sockets faster. There are some 4 billion of those incandescent sockets in the U.S.

And, there just may be a trick or two that can be used to get better color for less - at least for LED light source products. Here's how it

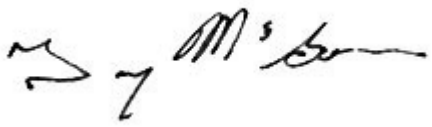
works: The missing color in the light output of "warm" 2700 to 3000 Kelvin white-light LED products which have CRI values of 80+ is deep red. So, by adding a red LED in an array of white LEDs, the red light output can be enriched at a low cost with a product that doesn't use a phosphor. Control the light output of that red LED so the white light remains balanced and you improve the CRI of the light source and, particularly, the so-called "R9" value. I won't go into the technical details of that, but you can see what R9 red looks like by clicking here. Scroll down the page to the paragraph entitled "Test Color Samples" and then take a look at the sample "TCS09" or "Strong Red." That's the color that matters most if an LED light source is to emit light that renders colors like an incandescent bulb.
Discussing the subject with the California Energy Commission lighting people earlier this year, I found that they had been thinking along the same lines. So, the draft lighting requirements which were posted a few weeks ago call for a minimum CRI of 90. Responses from manufacturers have, so far, indicated that 90 is impractical and too costly - especially for CFL light sources - and that's probably correct; but there are more and more good color, high-performance LED modules available and one caught my eye recently. It was rated for 700 lumens and 21 watts (33 lpw) and either 2700 or 3000 Kelvins with a CRI of 95. The intended application: museum lighting.

In his "Postings" newsletter this week, DOE's Jim Brodrick highlighted a small LED bulb manufacturer building products in Florida. The DOE has tested a screw-in bulb from this company which delivers about the light output of a standard 60-watt bulb, but at an efficacy of 97 lumens/watt, 2880 Kelvins of warm white light and a CRI of 93.

From a color standpoint, these sound like incandescent light sources to me and I can't wait to see what they look like. I also want to be sure that the California Energy Commission, Energy Star and others who are writing residential lighting regulations accommodate and reward high color performance along with high efficacy.

So, are we shooting too low and missing the chance to give our customers what they say they want from the color standpoint? I think there are residential customers out there who are ready to respond to a marketing message of "energy savings and color just like incandescent" - even at a price premium.

What do you think?



Sincerely,

Terry McGowan, FIES, LC
ALA Director of Engineering & Technology