IMPROVING THE CIE COLOUR RENDERING INDEX – HOW THIS CAN BE DONE AND WHY IT MATTERS

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Colour rendering of light sources is a surprisingly subtle concept that many find difficult to fully understand. It is becoming increasingly important because of the unavoidable trade-off between the colour rendering quality of light sources and their luminous efficacy - which has significant economic and social consequences. A related issue is that recent observations show the current CIE Colour Rendering Index (CRI) does a poor job of assessing the colour rendering quality of the light from some narrow-band light sources. This presentation concerns a recent collaboration including R. Luo, J. Schanda, and K.Smet, in which we have found that at least part of the problem is non-uniformity of the spectral sensitivity of the current CRI metric. We have developed an improved computational procedure that eliminates that problem, and numerous groups are now assessing it. The hope is that a better measure of colour rendering will assist researchers in establishing the importance of lighting quality as opposed to quantity, in turn leading to more pleasant and sustainable interior environments.

The inadequacy of the current CRI has become particularly evident with the consideration of white light sources employing several narrow band light emitters, such as light emitting diodes. A key problem with the current CRI calculation method, and also with some previously suggested improvements, has been their lack of spectral uniformity in their sensitivity to sharp spectral features. One way of obtaining greater response uniformity would be to have a series of test samples in which a fairly smooth spectral feature shifts, from one sample to the next, through the spectrum. By employing this guiding principle, we have devised an improved sample set that substantially eliminates the problem of non-uniform spectral sensitivity.

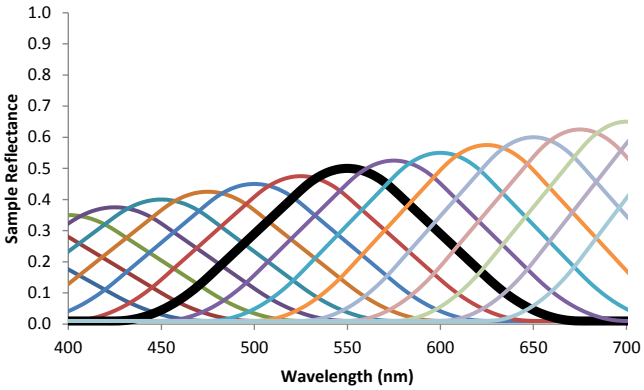

Figure 1. The HL17 reflectance spectra which optimize the spectral response uniformity for calculation of CRI. One of the spectra is shown in bold, as an example.

We propose the HL17 spectra as an improved sample set for more accurate evaluations of the average colour rendering difference between two spectral irradiance distributions. However, even with this improved accuracy, we are not suggesting that the CRI should be used alone for evaluation of the general level of human preference of a given light source. In particular, this new work does not imply that Planckian and/or daylight spectra are necessarily optimal for human vision. Nevertheless, the CRI has been an important tool for many years, and we feel that with a new sample set as described here, it can remain a useful metric in the future, as energy efficiency concerns grow and narrow band light emitters become common.