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16. Abstract

Because of rapid improvements in the light output of light-emitting diodes (LEDs), serious consideration is being given to using LEDs as light sources for headlamps. This study examined the potential effects of LEDs on discomfort glare for oncoming drivers and on color rendering of retroreflective traffic materials. In both cases, the effects of LED light sources were compared to the changes in these properties that occurred when the traditional tungsten-halogen light sources were replaced with high-intensity discharge (HID) light sources. Specifically, the effect on discomfort glare was estimated by comparing the chromaticities of 7 LED light sources (considered for use in headlamps) with the chromaticities of the light sources from 17 actual HID headlamps. Analogously, the effects on color rendering were estimated by comparing the chromaticities of 46 retroreflective materials when illuminated by the LED light sources with the chromaticities of the same materials when illuminated by the HID light sources.

The main findings concerning the range of LEDs that are currently being considered for use in headlamps are as follows: (1) Headlamps using LEDs with the chromaticities examined here are predicted to lead to more discomfort glare than the current HID headlamps, and substantially more discomfort than tungsten-halogen headlamps. Keeping the correlated color temperature as low as practicable is likely to minimize the problem. However, the relationship between spectral power distribution and discomfort glare is not fully understood, and further research on this issue would be valuable. (2) Color rendering with headlamps using the LEDs examined here is likely to be acceptable. (3) The spectral power distributions of headlamps using the LEDs examined here will not have appreciable effects on the relative brightness of colored retroreflective materials.

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