Development of a "sedimentation-free" phosphor for LED color bin yield enhancement

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The conventional phosphor-conversion white LED is fabricated by dispensing silicone gel mixing with yellow phosphor into the blue LED package. However, the sedimentation of phosphor particles affects the color coordinate of white light LED during the dispensing process. In this study, we present a "sedimentation-free" phosphor for LED color bin yield enhancement.

The concept of sedimentation-free phosphor is to transform the density of phosphor (4.5~5.5g/cc) close to the density of silicone (~1g/cc) by bonding the hollow sphere (0.46~0.6g/cc). The bonding process is carried out by the sol-gel hydrolysis condensation process [1]. The equivalent density of the sedimentation-free phosphor could be controlled within 1±0.2g/cc. Fig. 1 shows the concept and fabrication result of the sedimentation-free phosphor.

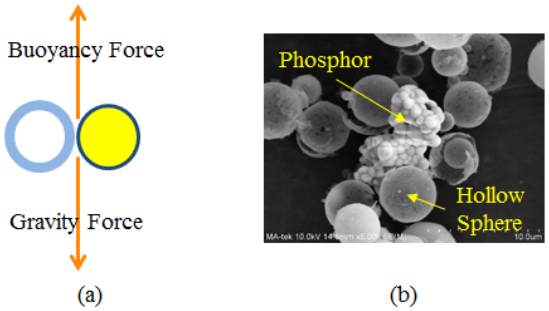

Fig. 1. Concept and fabrication result of sedimentation-free phosphor

The LED color bin yield experiments are performed by dispensing silicone gels with conventional and sedimentation-free phosphor into PLCC-5630 LED packages. As shown in Fig.2, the color bin yield could be improved to 89% in 4X-SDCM (every ellipse means 1X-SDCM) within 3 hours by using the sedimentation-free phosphor.

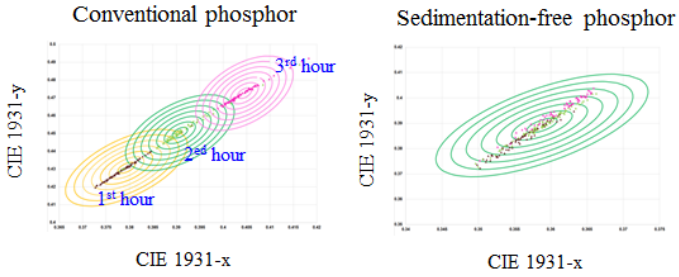

Fig. 2. Comparison of conventional and sedimentation-free phosphor color bin yields

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References

1. C. Jeffrey Brinker and George W. Scherer, *Sol-Gel Science: The Physics and Chemistry of Sol-Gel Process,* (1990).