



Fig. 6. Angular CCT distribution comparison between conventional coating and the present coating method at the average CCT around 9150K, (a) for the conventional chip and (b) for the vertical injection chip.

Figure 6 shows the comparison between the conventional coating and the present conformal coating method when the average CCT is about 9150K. It can be found that the color deviations of the present conformal coating is about 1000K and less than that (about 5000K) by dispensing coating for both conventional chip and vertical injection chip. Therefore, the present conformal phosphor coating using capillary microchannel can be used to improve the ACU. It is believed that better ACU can be obtained by employing the optimal coating process parameters in the present coating method.

Table 1. Average CCT variation with different phosphor-silicone mixture volumes

Volume(μ L)	0.3	0.35	0.4	0.45	0.5
CCT(K)	4321	4309	4316	4351	4369

This conformal coating using capillary microchannel presents high CCT consistency to the deviation of phosphor-silicone mixture volume. Table 1 shows the average CCT variations with different dispensing volumes. It can be found that the CCT varies less than 80K when the mixture varies from 0.3ul to 0.5ul. It is because that the mixture volume staying around the chip keeps the same and the CCT is hardly affected by the volume deviation in spontaneous flow. Therefore, the average CCT is less affected by the dispensing volume deviation.

5. Conclusions

A novel conformal coating using capillary microchannel is presented to reduce the color deviation for the white LEDs in this paper. The experimental results show that this coating method can effectively improve the ACU for both conventional chip and vertical injection chip at different overall color temperature ranges. Additionally, the present coating method exhibits good CCT consistency to the dispensing volume deviation of the phosphor and silicone mixture, which is helpful for mass production.

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