As can be seen in Fig. 6(a), the simulation results obtained under a full classical electromagnetic formalism describing dipole emitters in a cavity structure [20, 21, 23] show a good match to the experimental data obtained for Devices A, and it indicates that the intensity enhancement ratio between those with and without the bottom Ag layers follows a broad spectral envelope with the full-width half-maximum (FWHM) even comparable to the full visible spectral range, being consistent with the spectrally balanced enhancement in the proposed white BiOLEDs. (See Fig. 6(a)) The simulation results presented in Fig. 6(b) and 6(c) for top-emission direction further show that increasing the MC effect by making both of the Ag layers too thick indeed reduce the spectral width of the cavity-induced intensity enhancement, which may then cause undesirable side effects such as spectral distortion or reduced CRI. Nevertheless, the proposed white BiOLEDs are expected to exhibit spectrally balanced enhancement over the entire visible spectral range provided that the thickness of top and bottom Ag layers is maintained within the range of approximately 10 nm - 20 nm.

4. Conclusions

In summary, the performance of white-emitting BiOLEDs has been enhanced and the balance between bottom- and top-emission has been improved by controlled introduction of MC effects. We find that the overall current efficacy of BiOLEDs can be increased without significant distortion of the white EL spectra when the reflectance of the electrodes in the BiOLED is carefully managed.

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