

Fabrication of white LED using non-toxic carbon nanoparticles and ZnCuInS nanocrystals

정원근, 정현철, 이창훈, 김성현*
고려대학교
(kimsh@korea.ac.kr*)

In this study, high brightness white LED was fabricated using non-toxic Cd-free carbon nanoparticles (NPs) and ZnCuInS based nanocrystals (NCs) as color convertor. Carbon NPs were synthesized by carbonization of citric acid in mixture of 1-hexadecylamine and octadecene at 300°C. The obtained carbon NPs was ~10nm, and broad absorption bands was observed with peaks at 350, and 440nm. Due to the different emission trap sites, red shift was occurred with increasing excitation wavelength. ZnCuInS NCs were prepared by using zinc acetate, indium acetate, copper(I) acetate, 1-dodecanethiol, sulfur powder as Zn, In, Cu, and S precursors, respectively. By adjusting substitution of Zn ratio, the emission wavelength could tune from 540nm to 650nm. The FWHM was ~100nm, and quantum yield was reached to 60%.

White LED was fabricated by combining 380nm UV LED chip and carbon NPs and ZnCuInS NCs. Carbon NPs and ZnCuInS NCs acted as bluish-green and orange color convertor, respectively. The emission properties were investigated by measuring CIE, color rendering index, and color temperature.