Achieving high yield quantum dot/polymer films through silica particle aided dispersion enhancement

김현창, 홍현국, 윤철상, 최 훈, 안익성, 이도창[1], 김영주,
이강택*
연세대학교; [1]KAIST
(ktlee@yonsei.ac.kr*)

We have fabricated quantum dot (QD)/polymer films of high quantum yield by coating silica or hollow silica particles with QDs. When particles were dispersed in tetrahydrofuran, free QD suspension exhibited higher quantum yield than QD-coated silica/hollow silica particles. Scattering is a most likely reason for the drop in quantum yield for the QD-coated silica particles, as supported by results with silica particles with varying morphologies. In the QD/polymer films, however, QD-coated silica/hollow silica particles showed significant enhancement in quantum yield. The quantum yield of QD-coated hollow silica particles was lower than that of QD-coated silica particles because of lower structural stability. Introducing silica particles prevents spectral redshift of emission peak when prepared in the form of film, as opposed to QD-only sample. Our findings point to the possibility that QD-coated silica/hollow silica particles exhibit superior stability, quantum efficiency, and color accuracy, which render them potentially useful for the next-generation light-emitting devices and photovoltaics.