Abstract Submitted
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Wide PL spectra of plasmon-coupled CdSe QDs for hybrid white LEDs[1] QUINTON RICE, ANDERSON HAYES, Hampton University, SANGRAM RAUT, Texas Christian University, RAHUL CHIB, University of North Texas Health Science Center, ZYGMUNT GRYCZYNSKI, Texas Christian University, IGNACY GRYCZYNSKI, University of North Texas Health Science Center, ANDEW WANG, Ocean NanoTech, BAGHER TABIBI, JAETAE SEO, Hampton University — Plasmonic coupling of CdSe quantum dots (QDs) has been extensively studied due to their many benefits to the field of optoelectronics including wide optical tunability, high color purity, and large PL enhancement in the vicinity of plasmonic nanoparticles. The fluorescence of CdSe QDs originates from exciton carrier recombination, whereas discrete energy states and blue-shift from the bulk bandgap (˜718 nm) arises from quantum confined carriers when the QDs are near the exciton Bohr radius (˜5.8 nm) in bulk. Inclusive analysis of the major emission sites revealed the band-egde and surface-trapped state transitions to be the principal contributors to the PL while the studies of plasmon-exciton coupling elucidated the reduction of nonradiative transition and PL enhancement with the strong local field. The time-resolved spectroscopy revealed the decay rates of bandedge and surface-trapped states, and the temperature-dependent PL studies explained the thermal quenching of QDs with/without plasmon coupling. The hybrid white LED is realized with the spectral combination of blue LED excitation, intermediate spectrum from bandedge transition, and broad spectral distribution of surface trapped state in addition to the large PL enhancement through plasmon-exciton coupling.

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