High-resolution Patterning of Colloidal Quantum Dots via Light-driven Ligand Crosslinking

강문성†
서강대학교
(kangms@sogang.ac.kr†)

To fully exploit the excellent luminescence characteristics of quantum dots (QDs), researches on EL displays based on QDs have been actively conducted. To achieve this, a multi-color QD patterning technology must be established. Processing and patterning of quantum dots involve a solution-based technique, unlike the organic light emitting materials which are typically deposited through evaporation-based technique. The applicability of QDs to various solution process allows one to carry out their deposition over a large-scale at low cost, but it also causes a problem of dissolving the bottom layer if the secondary layer is applied by solution process consecutively. Here we report a simple way to obtain high-resolution patterns of QDs using a chemical crosslinker (bis-perfluorophenyl azide)[1] that can bind to ligands surrounding the QD surface to form a bridging network upon exposure to UV, which is referred to as the light-driven ligand crosslinker (LiXer). Due to the chemical durability of the cross-linked QDs, non-crosslinked portions can be etched chemically to form high resolution (<3 μm) patterns of QDs. Multi-color patterns can also be stacked laterally or vertically by repeating the same solution process. The EL characteristics of the cross-linked QDs varied systematically with the loading of the LiXer. The optimal loading of the LiXer yielded the cross-linked QDs with EL characteristics comparable to those of pristine QDs. The simple strategy converting the QD films to be photo-resistive will make significant impact enabling the production of high-resolution, high-throughput, full-color EL displays based on QDs intensively explored in the community.