Surface functionalization of colloidal quantum dots with inorganic ligands: electronic device application

장재영†
한양대학교
(jyjang15@hanyang.ac.kr†)

Colloidal nanocrystals (NCs) can combine the advantages of crystalline inorganic semiconductors with the size-tunable electronic structure and inexpensive solution-based device fabrication. Many practical implementations of NCs are hindered by the poor electronic coupling in close-packed NC films, caused by the presence of bulky organic surface ligands. To address this fundamental problem, various types of inorganic surface ligands are introduced. These new approaches to surface termination of colloidal NCs provide a set of advantages such as all-inorganic design and diverse compositional tunability for both NCs and ligand constituents. By using optimized inorganic surface ligands, NC solids are prepared exhibiting band-like charge transport, high photoconductivity and tunable doping level. Finally, a solution-based "soldering" process is introduced to fabricate ultra-high electron mobility (>300 cm2/Vs) NC transistors using colloidal NCs with molecular "solders".