Colloidal CdSe Tetrapod Nanocrystals for Thin Film Transistors

허현준, 차국헌†, 강문성[1]
서울대학교; [1]숭실대학교
(khchar@snu.ac.kr†)

Colloidal semiconductor nanocrystals have drawn keen attention as one of the most attracting materials for high performance thin-film electronic/optoelectronic devices for few decades, by their superior electrical transport and well-known unique physical properties. However, the carrier transport through assemblies of nanocrystals is limited by inefficient inter-nanocrystal hopping processes. In order to break through the limitation, numbers of researches have been performed. Typical approach is replacing the bulky ligands attached on the nanocrystal surface, and another approach is controlling the structure of the nanocrystals. In this study, we utilized tetrapod shaped colloidal CdSe semiconductor nanocrystals with arm length up to 100nm. In a framework of ionic gel-gate thin film transistor system, CdSe Tetrapod networks treated with sodium hydroside showed electron mobility of up to 10cm2V-1s-1, which is about a 10-fold improvement compared to values obtained from assemblies of spherical CdSe nanocrystals. This enhancement relative to the spherical nanocrystal system is attributed to the extended delocalization of carrier within a tetrapod nanocrystal and reduced number of carrier hopping necessary within the same path length of CdSe TP networks.