Optimal Core-Position Design of Colloidal CdSe/CdS Dot-in-Rods Heterostructures for Photocatalytic Hydrogen Generation

김귀민, 이도창†
한국과학기술원
(dclee@kaist.ac.kr†)

Photocatalysis enables solar energy harvesting as chemical bonds. For practical accomplishment of solar-light utilization, photocatalysts should simultaneously satisfy several outstanding properties, such as wide range of light absorption, charge carrier generation and transport, and catalytic reaction rates and selectivities. Semiconductor quantum dots has attracted great attentions in that respect, as they have tunability of absorption coefficients of wide range of energies, high carrier mobility and stability. Among them, CdSe/CdS dot-in-rod structure, which consists of CdSe spherical core in CdS rod, shows slow exciton recombination and, therefore, exceptional hydrogen generation activity.

In this work, we systematically control CdSe core position in the CdS nanorod with adjusting growth rate in axial direction in CdSe/CdS dot-in-rod heterostructure. CdSe/CdS dot-in-rod core position dependent photocatalytic activity and design efficient structure of CdSe/CdS dot-in-rod structure for photocatalytic hydrogen evolution. By using different facet reactivity of wurtzite structure, we synthesized core position controlled CdSe/CdS dot-in-rod.