Core Position Control of CdSe/CdS Dot-in-Rod Hetero-structure for Efficient Photocatalytic Reaction

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Colloidal quantum-dot photocatalysts has attracted great attention for water splitting hydrogen generation because of their many advantages, such as size-dependent absorption properties, longer exciton lifetimes, possibility of generating multiple excitons by single photon, and enhanced photo-stability. Among them, CdSe/CdS dot-in-rod structure, which consists of CdSe spherical core in CdS rod, shows slow exciton recombination and highest hydrogen generation activity than core-shell CdSe/CdS hetero-structures. As overlap region of electron and hole probability wave function decreases, dot-in-rod structure shows slow recombination rate, enhanced charge separation rate, enhanced photo-stability. Also, different reactivity of various CdS facet enables co-catalyst amount control and therefore affects hydrogen evolution activity.

In this work, we systematically investigate CdSe/CdS dot-in-rod core position dependent photocatalytic activity and design efficient structure of CdSe/CdS dot-in-rod structure for hydrogen evolution. By using different facet reactivity of wurtzite structure, we synthesized core position controlled CdSe/CdS dot-in-rod.