Thin Amorphous TiO_2 Shell on CdSe Nanocrystal Quantum Dots Enhances Photocatalytic Hydrogen Evolution from Water

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Photocatalytic water splitting of CdSe nanocrystals (NCs) with TiO_2 was studied. A thin shell of amorphous TiO_2 (a-TiO_2) onto CdSe NCs serves as a channel for charge carriers otherwise unutilized and results in higher photocatalytic activity than the mixtures of CdSe NCs with TiO_2 particles. amorphous or crystalline. Type Ⅱ band offset in CdSe/a-TiO_2 appears to help the electron in the conduction band of CdSe NCs transfer to that of a-TiO_2, which results in an increased rate of hydrogen production from water. Size of CdSe NCs influences the photocatalytic hydrogen evolution due to the energy difference between the conduction bands of semiconductors. Electron transfer from a CdSe NC to a-TiO_2 layer is influenced by the level of the conduction band edge of CdSe NCs and the size dependence indicates that electron injection to TiO_2 is facilitated with energy level offset between CdSe and TiO_2.