Solar-driven H_2 Evolution from Photo-reforming of Biomass with Colloidal Quantum Dots

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Solar-driven hydrogen evolution is a topic of great significance for solving the global energy problem by storing abundant solar energy into hydrogen fuel (H_2). H_2 can be produced through artificial photosynthesis process using solar energy as a driving force to promote reduction of water into hydrogen, coupled with oxidation of a substrate. Waste biomass is ideal oxidation substrates to promote H_2 generation through photocatalytic reforming, promoting both solar-to-H_2 conversion and environmental remediation. For H_2 evolution from photo-reforming (PR), the main hinderance we need to overcome is the great kinetical barrier in PR process caused by the recalcitrant polymeric structure of substrates. And the recalcitrant substrates theoretically require a large overpotential for the oxidation half-reaction of substrates. Colloidal semiconductor quantum dots (QDs) with their tunable band gap (Eg) and band edge level controlled by the size and surface compositions, have the potential of generating oxidizing VB holes with high energy to drive PR conversion. In this work, we focus on designing a novel QD-based photocatalysts to achieve the H2 evolution from photo-reforming of biomass.