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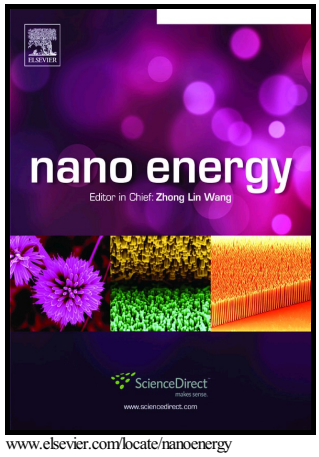

www.elsevier.com/locate/nanoenergy

PII: S2211-2855(18)30604-9
DOI: https://doi.org/10.1016/j.nanoen.2018.08.042
Reference: NANOEN2972

To appear in: *Nano Energy*

Received date: 29 May 2018
Revised date: 7 August 2018
Accepted date: 19 August 2018

Cite this article as: Haiguang Zhao, Guiju Liu, François Vidal, Yiqian Wang and Alberto Vomiero, Colloidal Thick-Shell Pyramidal Quantum Dots for Efficient Hydrogen Production, *Nano Energy,* https://doi.org/10.1016/j.nanoen.2018.08.042

Colloidal Thick-Shell Pyramidal Quantum Dots for Efficient Hydrogen Production

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Abstract

Colloidal semiconductor quantum dots (QDs) have attracted a great attention for their potential applications in optoelectronic devices, such as water splitting, luminescent solar concentrators and solar cells, because of their size/shape/composition-dependent optoelectronic properties. However, the fast electron-hole (e-h) recombination and slow charge separation of QDs limit their applications as light absorber in high efficiency optoelectronic devices. Here, we synthesized thick-shell CdSe/$CdSe_xS_{1-x}$/CdS QDs with pyramidal shape, which exhibit a quantum yield of ~15%, with a long radiative lifetime up to ~100 ns due to the spatial separation of the e/h wavefunction and significantly broadened light absorption toward the 500-700 nm range, compared to CdSe/CdS unalloyed QDs. As a proof-of-concept, the pyramidal QDs are applied as light absorbers in a photoelectrochemical (PEC) system, leading to