U.S. DEPARTMENT OF ENERGY | Office of Science

Photovoltaic performance of ultra-small PbSe quantum dots

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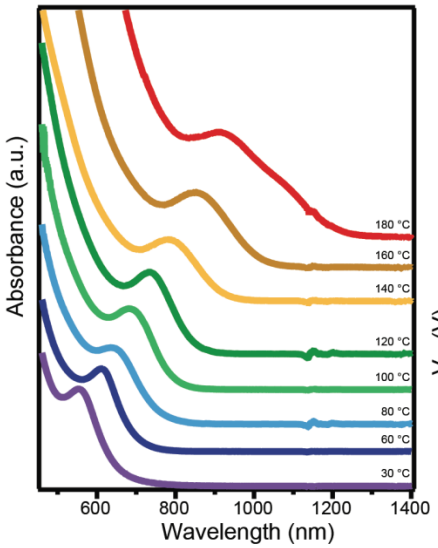

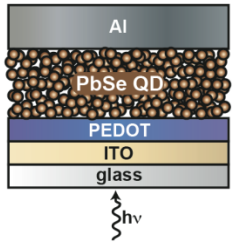

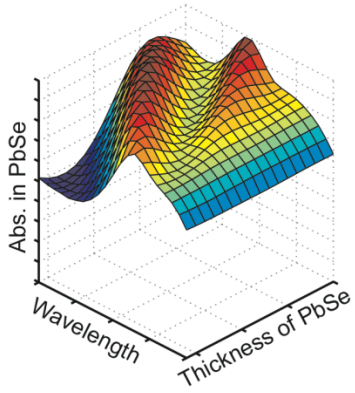

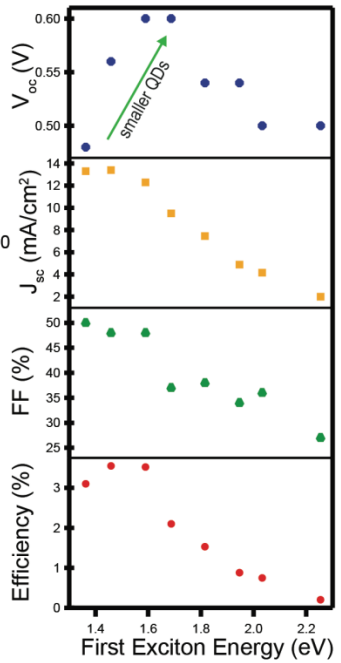

Achievement:

We developed a synthesis for ultra-small, strongly confined PbSe nanocrystals 1-3nm in diameter, allowing **absorption to be tuned across the entire visible spectrum**. A larger bandgap in smaller particles leads to **higher open-circuit voltages** (~0.6V) and **increased overall efficiency** (~3.5%) compared to previously reported photovoltaic devices of this structure.

Significance:

Precisely controlling nanocrystal size provides a simple pathway to improve efficiency when aiming for **low-cost, solution-processed solar cells**. We are investigating light-trapping mechanisms to further improve the efficiency of these devices.

W. Ma, S. Swisher, T. Ewers, J. Engel, V. Ferry, H. Atwater, and A. P. Alivisatos, ***ACS Nano 5****, 8140-8147 (2011)*

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LIGHT-MATERIAL INTERACTIONS IN ENERGY CONVERSION