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.