Supplemental Material

Study the mechanisms of phonon bottleneck effect in CdSe/CdS core/shell quantum dots and nanoplatelets and their application for hot carrier multi-junction solar cells

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S1. The details of structure and composition of QDs and NPLs

The detailed description of this QDs is CdSe/CdS core/shell QDs. With a diameter of 4.30 ± 0.41 nm CdSe core (see Figure S1a) for TEM images) and radius of 1.71± 0.25 nm CdS shell (~5ML CdS). The detailed description of this NPLs is CdSe/CdS core/shell NPLs. With a thickness of 1.22 ± 0.12 nm CdSe core (see Figure S1 b) for TEM images) and unilateral thickness of 1.36± 0.18 nm CdS shell (~4ML CdS).

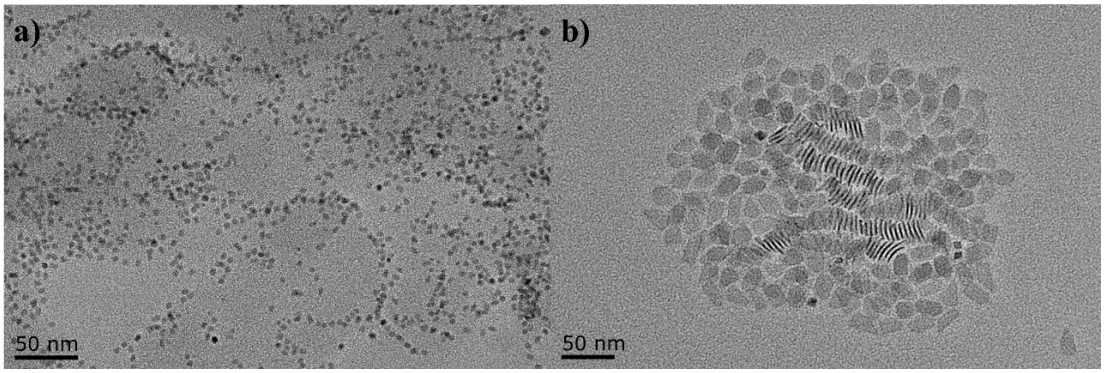
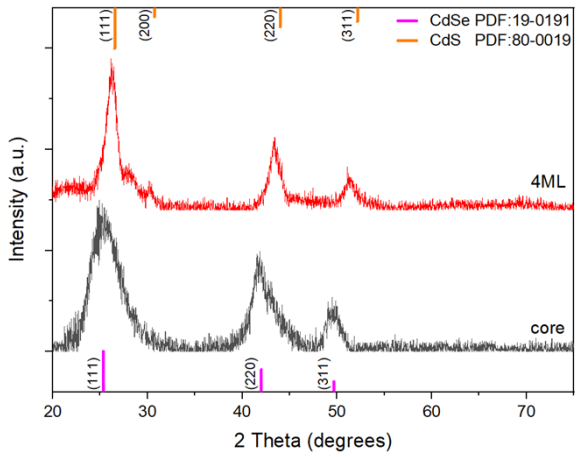


Figure S1. The TEM images of a) CdSe QDs core and b) CdSe NPLs core.

S2. The confirmation details of core shell structure of CdSe/CdS

Combining the TEM images of CdSe/CdS core/shell QDs and NPLs (Figure 1) in the main manuscript, it can be observed that their size increases significantly compared to Figure S1, which directly proves the encapsulation of the shell layer. For CdSe/CdS core/shell QDs, similar cladding work has been reported in our previous article[1]. Moreover, the X-ray diffraction (XRD) analysis of the samples can further explain the cladding of CdS shells. For CdSe/CdS core/shell NPLs, the XRD analysis are shown in Figure S2. It can be seen that the diffraction peaks of the samples on the <111>, <220>, and <311> crystal plane are between the standard XRD patterns peaks of sphalerite phase CdSe



and CdS, indirectly proving the coating of the CdS shell.

Figure S2. The X-ray diffraction analysis of CdSe/CdS core/shell NPLs are presented.

Reference

1. L. Zhang, H. Li, C. Liao, H. Yang, R. Xu, X. Jiang, M. Xiao, C. Lu, Y. Cui and J. Zhang, *J.Phys.Chem.C*, 2018, **122**, 25059-25066.