Supplementary information for

One-dimensional core/shell radial heterojunction with cascade type-II energy-band alignment for enhanced broadband photodetection

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Raman spectra were measured and shown in Fig. S1. The sharp peaks of the Raman spectra can also indicate that all materials are well crystalline. As shown in the Fig. S1a, a strong peak at 438 cm^{-1} can be assigned to the vibration mode of E_2^{high} which is associated with oxygen atoms and is an indication of crystallinity of wurtzite ZnO[1]. The spectrum in Fig.S1b shows the presence of two main peaks at 300 cm^{-1} and 603 cm^{-1} corresponding to first-order (1LO) and second-order (2LO) phonon modes of hexagonal wurtzite of CdS crystals[2]. Fig. S1c shows the 1LO mode at 166 cm^{-1} and their 2LO at 330 cm^{-1}, characteristic of CdTe[3]. It can be also observed that two shoulders at 120 cm^{-1} and 140 cm^{-1}, this shoulders correspond to the phonon mode with A_1 symmetry and E_1 symmetry of trigonal Te/TO mode of CdTe[4]. It has been identified that only (111) crystal plane allows both TO and LO phonon modes at peak position 140 cm^{-1} and 166 cm^{-1} respectively, which is similar with our Raman and XRD results of CdTe[5].

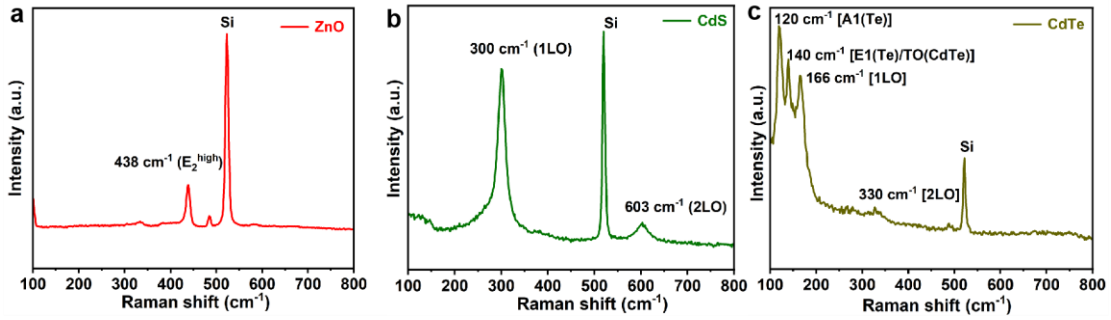

Fig. S1 a XRD patterns of ZnO, ZnO/CdS, and ZnO/CdS/CdTe. **d-f** Raman spectra of ZnO, CdS, and CdTe.

The the positions of the Fermi level, VBM, and CBM of each material have been calculated according to the UPS spectra in Fig. R1. The the positions of the Fermi levels of ZnO, CdS, and CdTe were calculated to be 2.62 eV, 3.66 eV, and 3.52 eV, respectively. The the VB energy levels were determined to be 5.65, 4.70, and 3.60 eV, respectively. According to the adsorption spectra in our manuscript, the band-gaps were calculated to be 3.30, 2.40 and 1.54 eV, respectively. Therefore, the corresponding CB edges were determined to be 2.35, 2.30, and 2.06 eV, respectively.

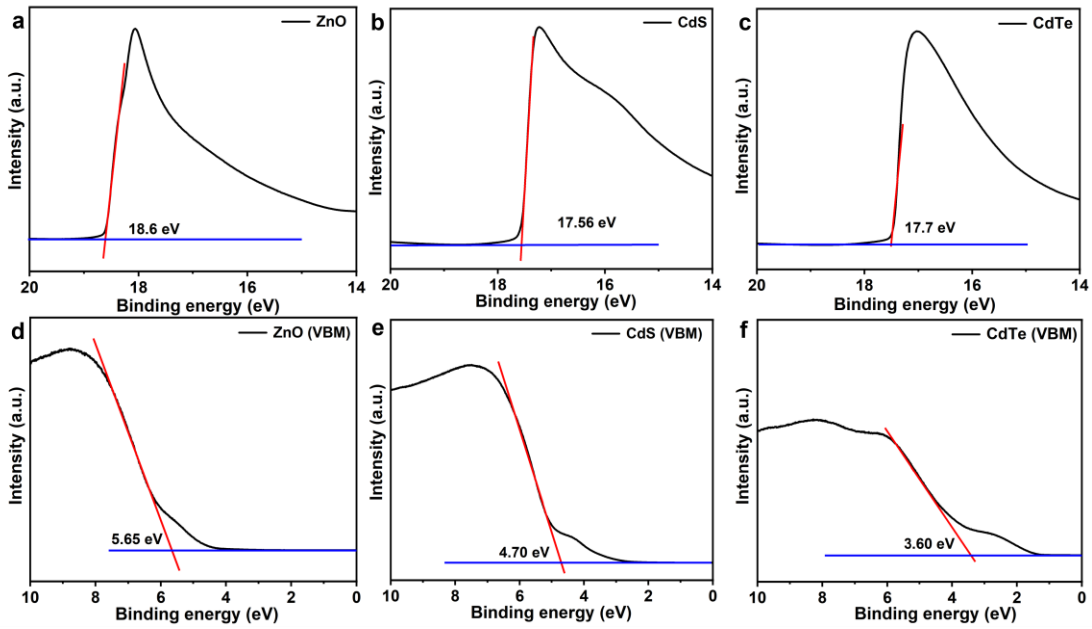

Fig. S2. UPS spectra of ZnO, CdS, and CdTe.

References:

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