Supporting information for the manuscript

Self-Assembly of Hierarchically Ordered CdS Quandum Dots-TiO_2 Nanotube Arrays Nanostructure as Efficient Visible Light Photocatalyst for Photoredox Applications

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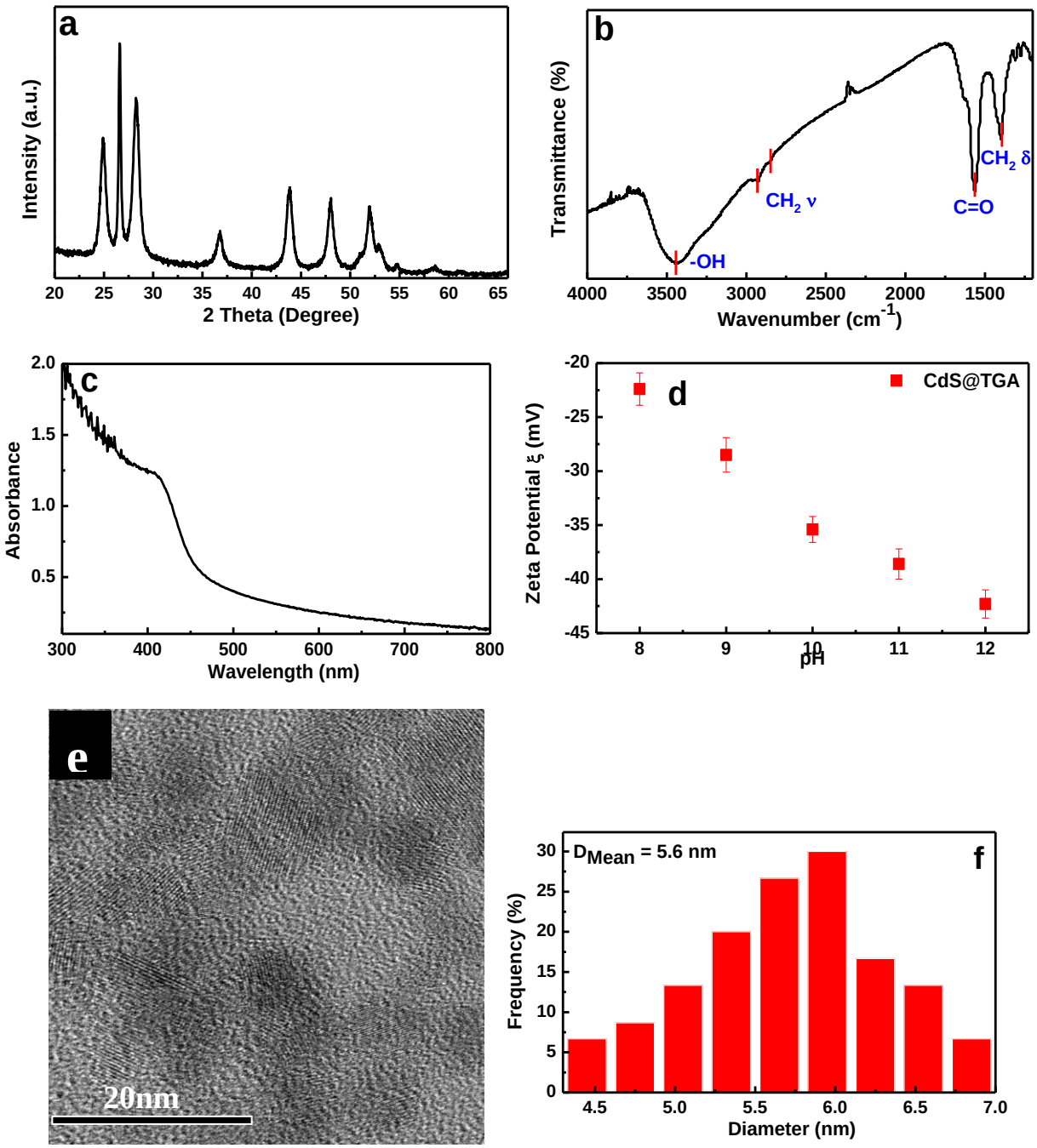

Figure S1. (a) XRD pattern, (b) FTIR, (c) UV-vis spectrum, (d) zeta potential, (e) HRTEM image and (f) mean diameter histogram of CdS@TGA QDs.

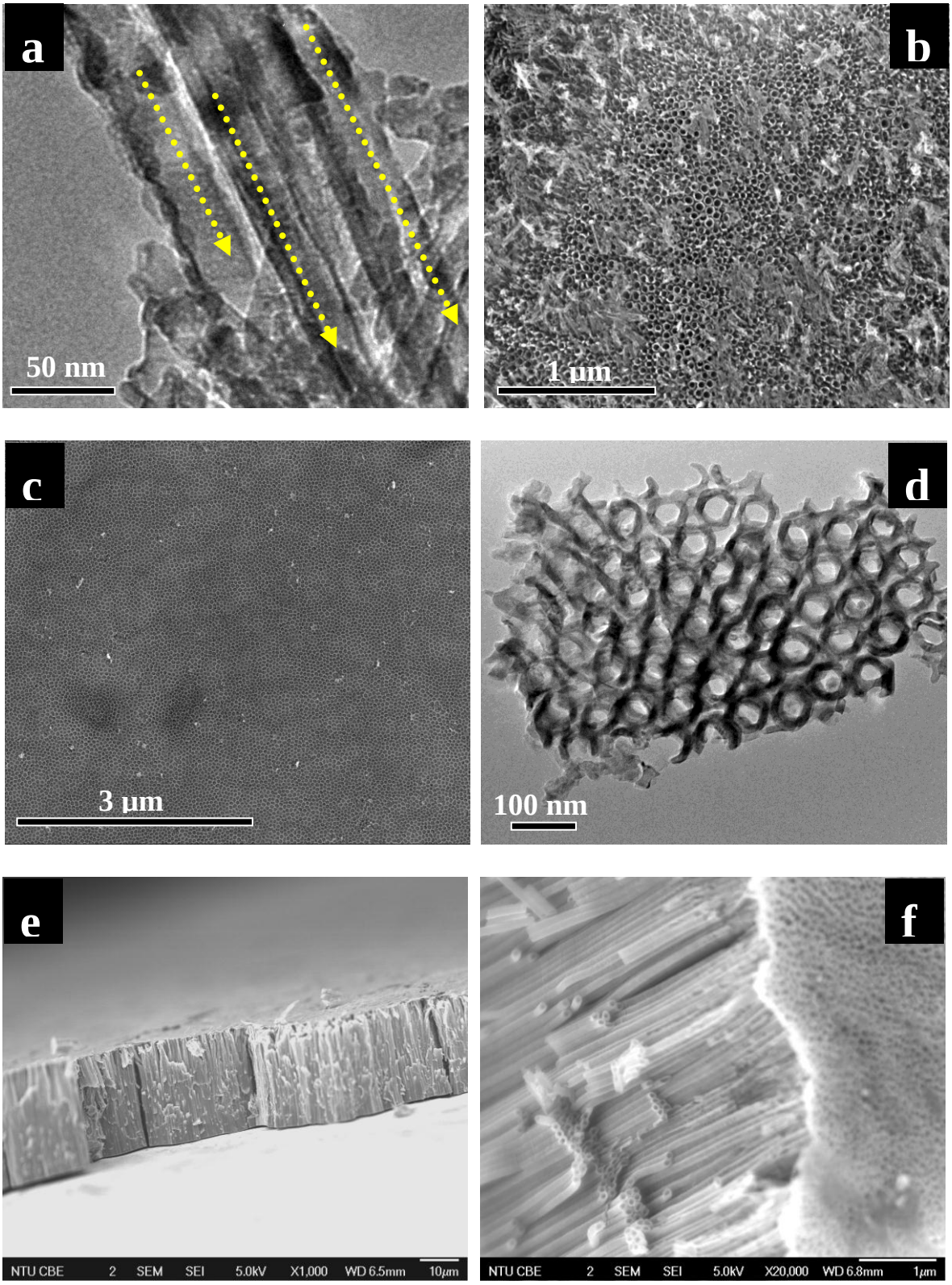

Figure S2. (a) HRTEM image of NP-TNTAs, (b) TNTAs prepared by 1st anodization, (c) panoramic FESEM image of nano-ring pattern on the surface of Ti foil after sonication, (d)TEM image of nanoring layer peeled off from NP-TNTAs, (e & f) cross-sectional FESEM images of NP-TNTAs.

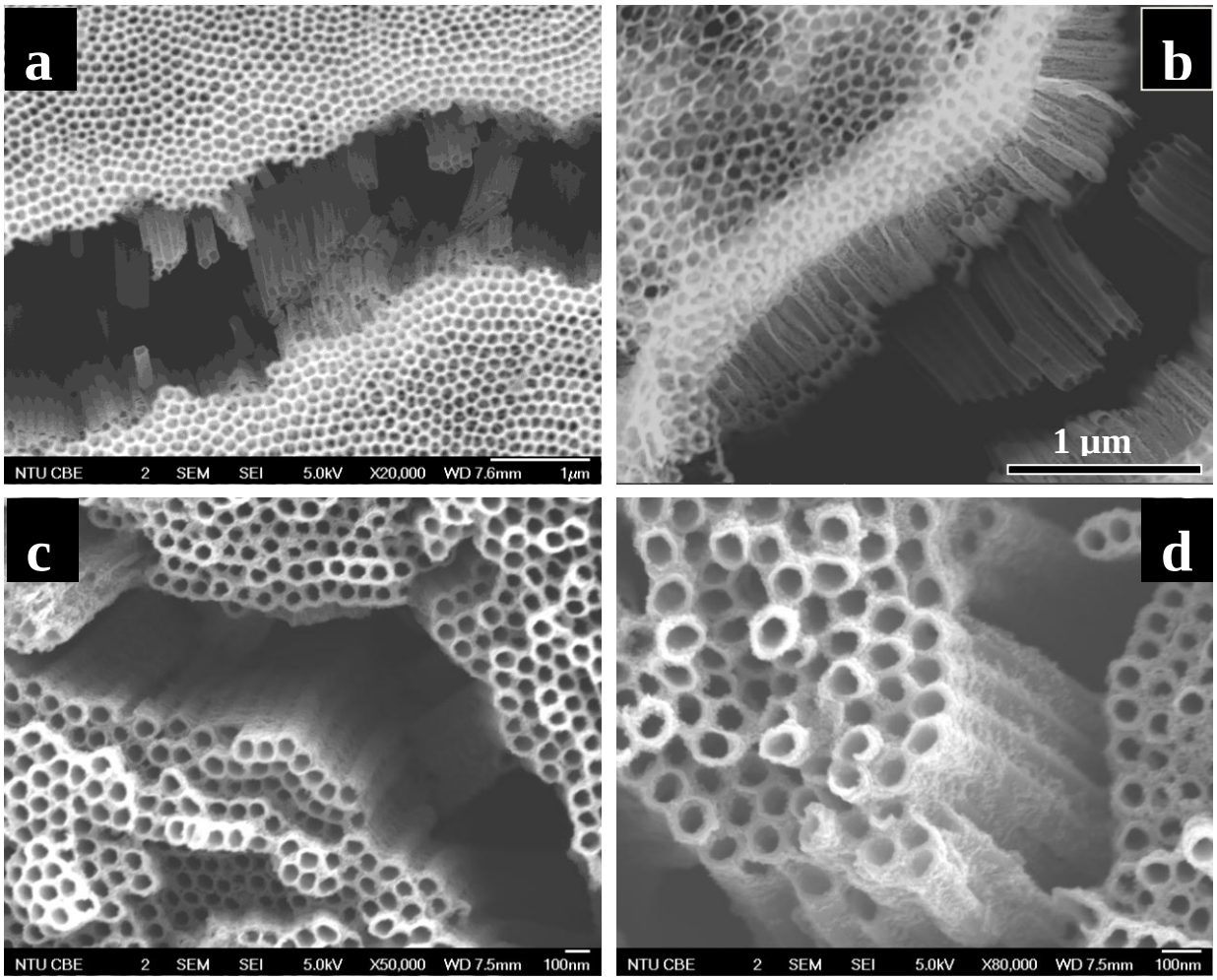

Figure S3. (a&b) Top view FESEM images of NP-TNTAs consisting of nano-ring/nanotube hybrid nanostructure; (c-d) FESEM images of bottom layer of the CdS/NP-TNTAs heterostructure when top nano-ring pattern was removed *via* gentle sonication.

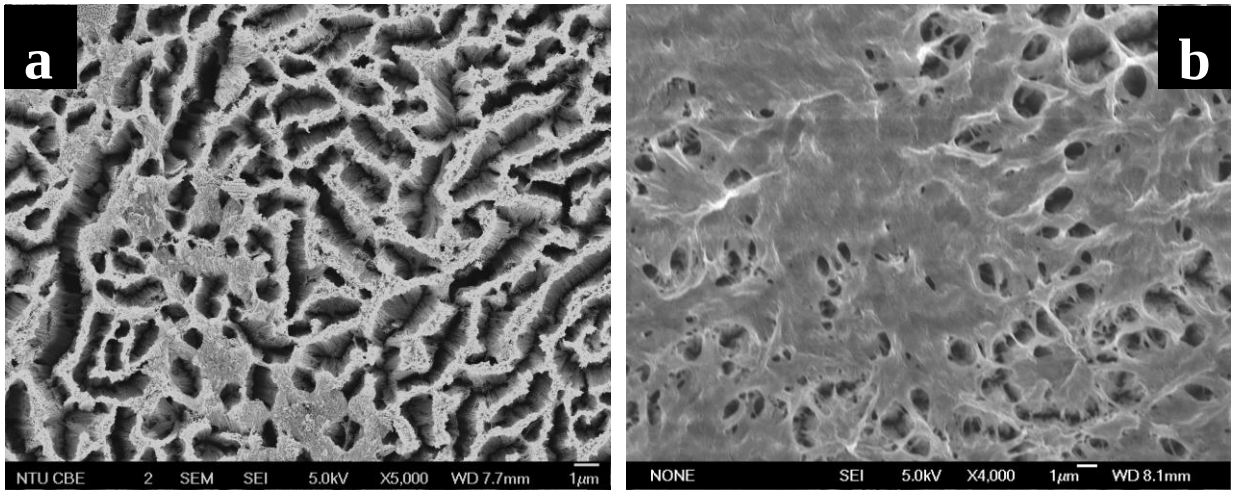

Figure S4. FESEM images of CdS/TNTAs *via* the same self-assembly strategy.

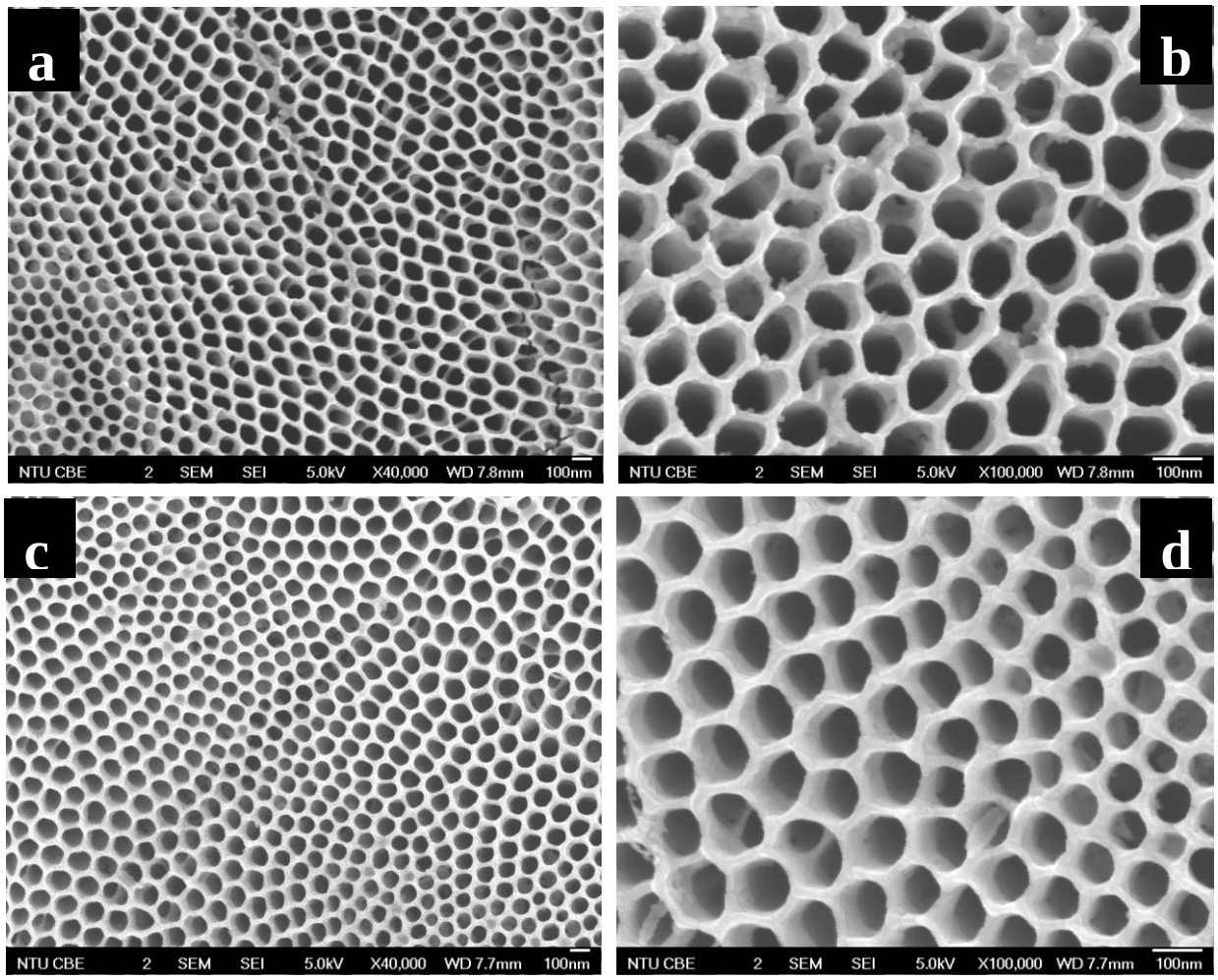

Figure S5. FESEM images of NP-TNTAs with different dipping time in PDDA aqueous solution (1 mg/mL, 0.5 M NaCl), (a&b) 15 min, and (c&d) 30 min, showing almost the same morphology to that of pure NP-TNTAs before dipping.

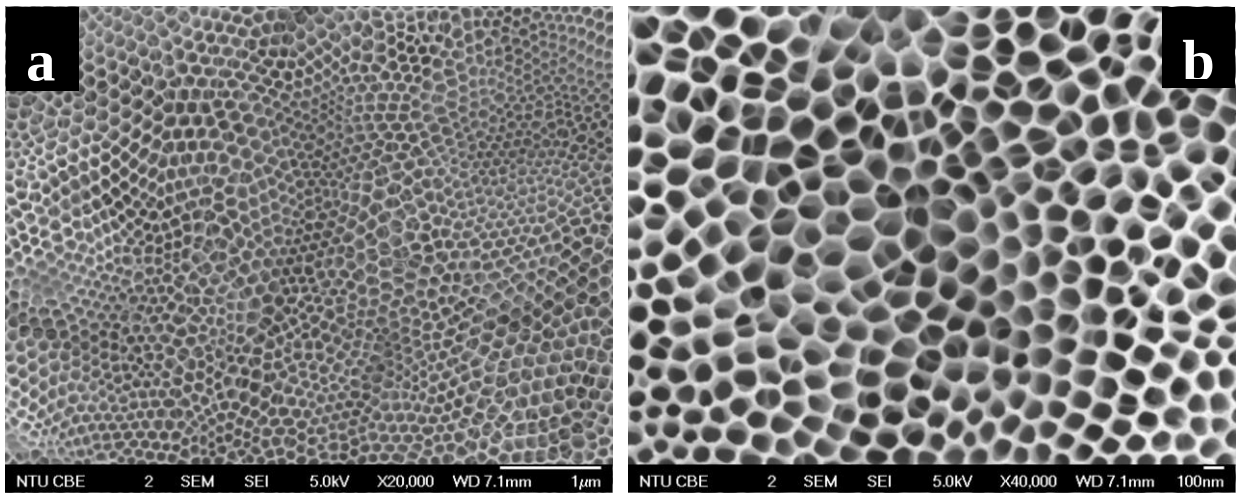

Figure S6. (a) Low and (b) high magnified FESEM images of NP-TNTAs directly dipped in the CdS QDs aqueous solution for the same time without the PDDA modification.

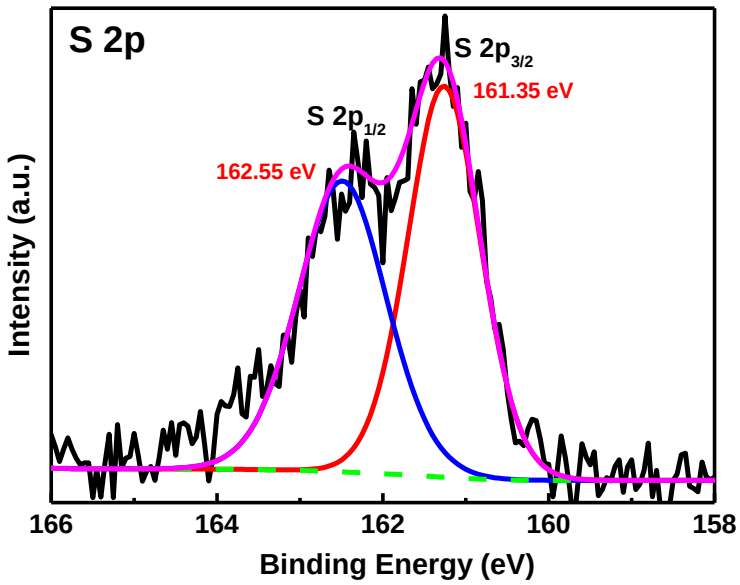

Figure S7. High-resolution spectrum of S 2p for CdS/NP-TNTAs heterostructure.

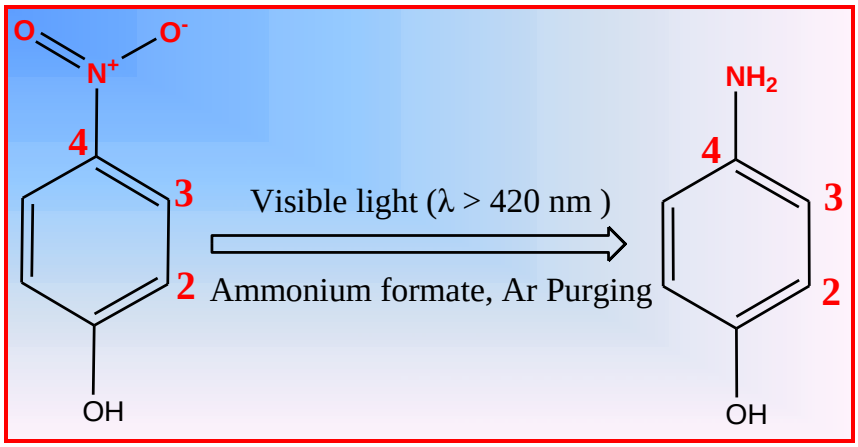

Figure S8. Photocatalytic reduction reactions of 4-NP, 3-NP and 2-NP over CdS/NP-TNTAs heterostructure under ambient conditions.

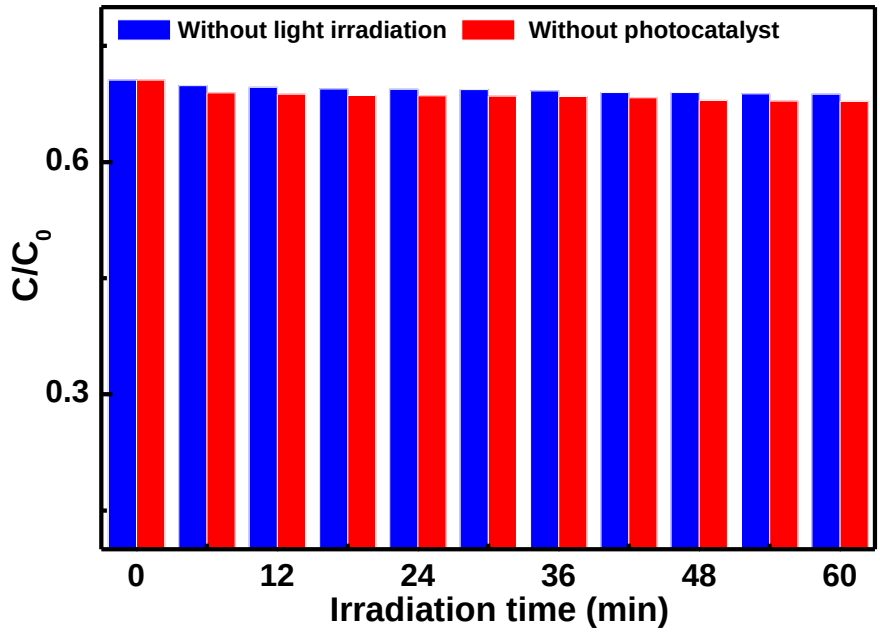

Figure S9. Control experiments for photocatalytic reduction of 4-NP over the CdS/NP-TNTAs heterostructure.

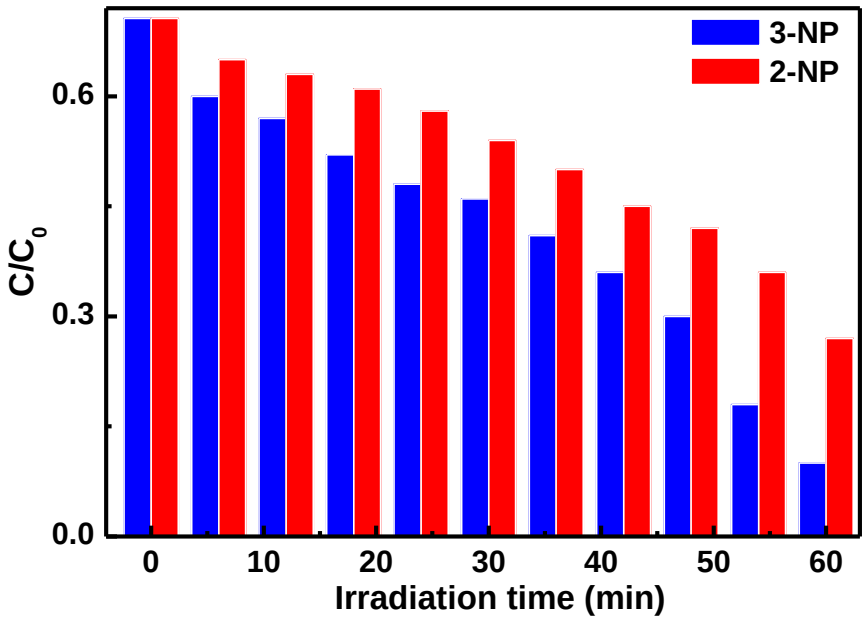

Figure S10. Photocatalytic reduction of homologues of 4-NP, (*i.e.* 3-NP and 2-NP) over CdS/NP-TNTAs heterostructure under visible light irradiation ($\lambda > 420$ nm) with the addition of ammonium formate as quencher for photogenerated holes and Ar purge under ambient conditions in the aqueous phase.

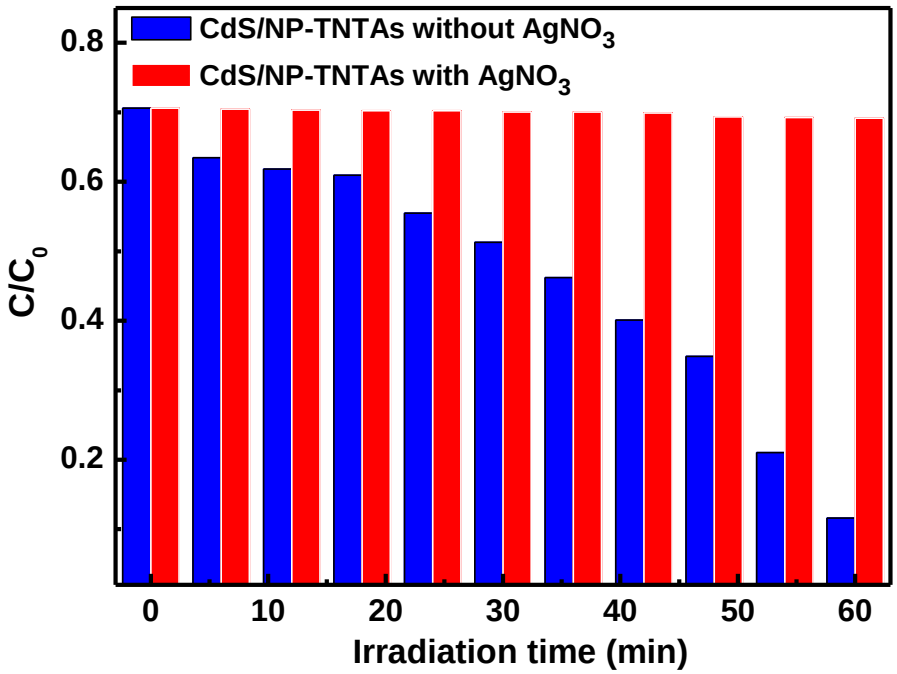

Figure S11. Control experiments using $AgNO_3$ as scavenger for photoexcited electrons for photoreduction of 4-NP over the CdS/NP-TNTAs heterostructure under visible light irradiation ($\lambda > 420$ nm) with the addition of ammonium formate as quencher for photogenerated holes and Ar purge under ambient conditions in the aqueous phase.

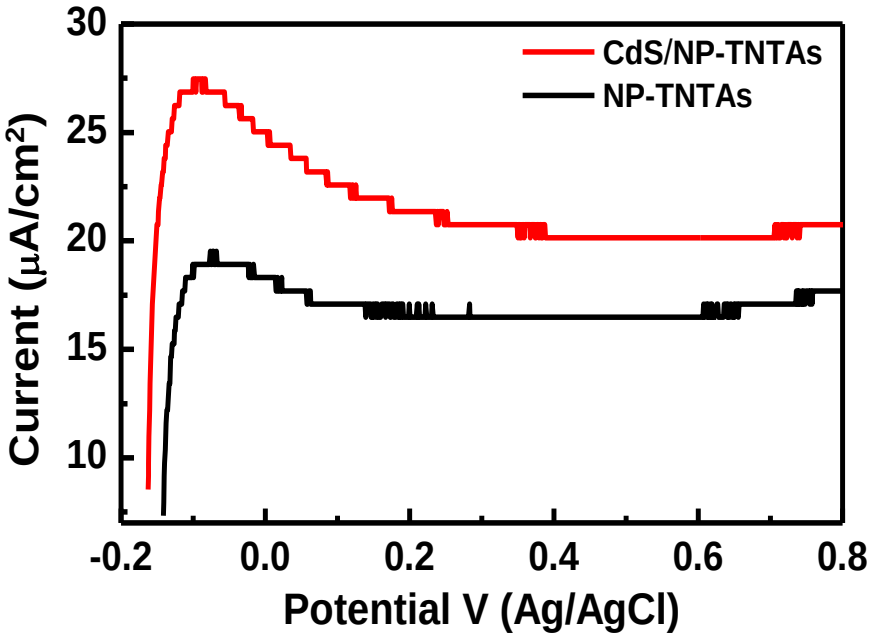

Figure S12. *I-V* curve of CdS/NP-TNTAs heterostructure and NP-TNTAs under illumination using three electrodes setup (NP-TNTAs working, Pt counter, Ag/AgCl reference electrode, scan rate: 100 mV/s).

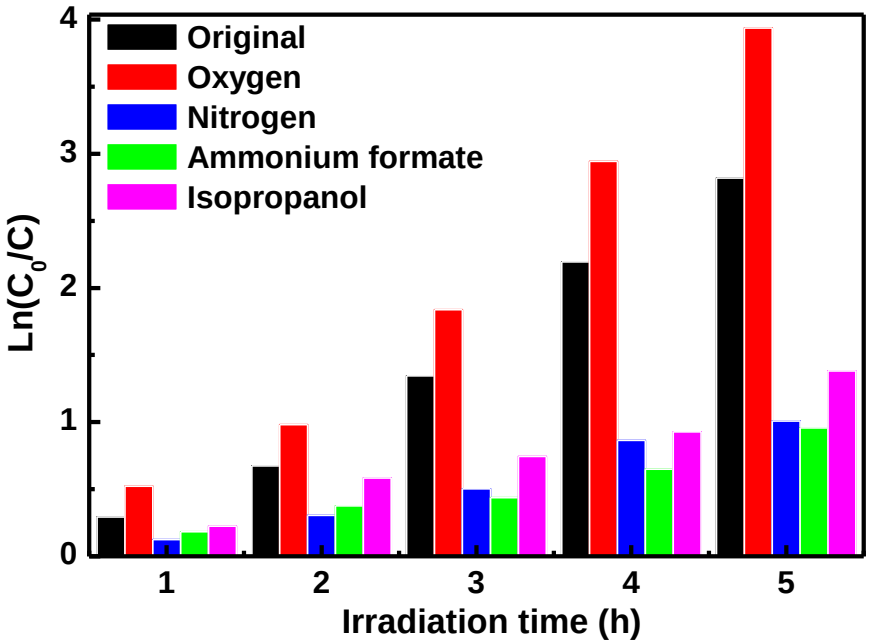

Figure S13. Photocatalytic performances of CdS/NP-TNTAs (*i.e.* photodegradation of MO) in the presence of O_2, N_2, ammonium formate (a scavenger for holes) and isopropanol (a scavenger for hydroxyl radicals) under ambient conditions.