Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Supporting Information

Enhanced Photoelectrochemical Performance of CdSe Quantum Dots Sensitized $SrTiO_3$

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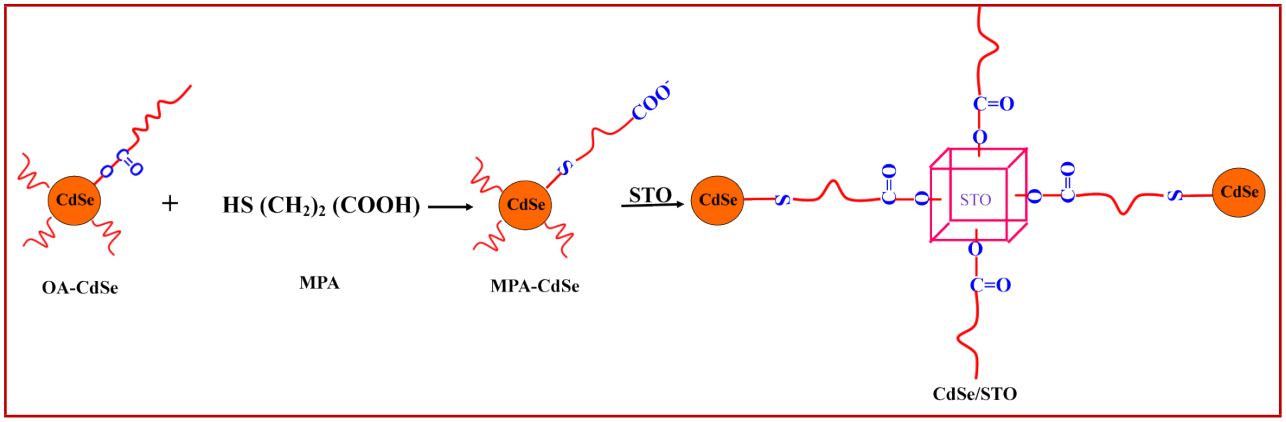

Scheme S-I. Schematic representation of CdSe QDs sensitization on STO nanocubes.

The linking of the red CdSe QDs on STO surface was achieved by using mercaptopropionic acid (MPA) as a linker (**Scheme S-I**). The oleic acid (OA) that was originally presented on as-prepared CdSe QDs surface was replaced by MPA. OA capped CdSe QDs were not suitable to be attached with STO. Therefore, the modification of OA capped CdSe QDs was performed by a ligand exchange process using hydrophilic linker MPA, which also maximised CdSe QDs loading on to STO surface.

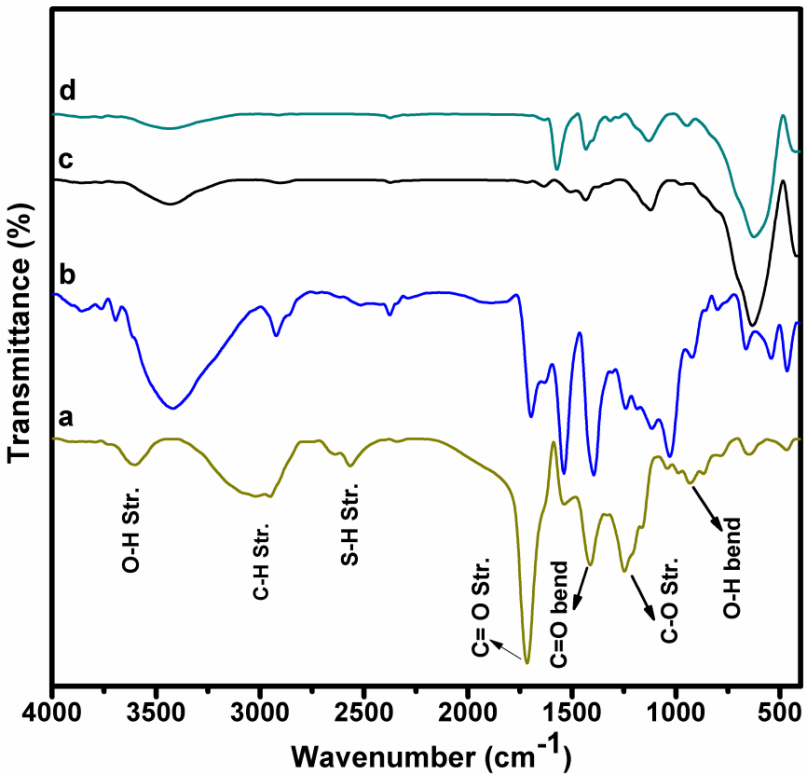

Fig. S1 FTIR spectra of (a) Mercaptopropionic acid (b) R-CdSe QDs (c) STO and (d) R-CdSe-MPA-STO photo electrodes.

Fig. S1a,b,c,d present FTIR spectra for mercaptopropionic acid, red CdSe QDs, STO and CdSe-MPA-STO, respectively. The linking mechanism as shown in Shceme S-I is explained with the help of FTIR analysis and discussed here. The peak associated with S-H stretching in MPA (2564 cm^{-1}) (Fig. S1a) was suppressed in MPA capped CdSe (Fig. S1b), while the –CH stretching peak shifted from 3000 – 2900 cm^{-1} as noted earlier.[S1] This observation indicates the bond formation between thiol group of MPA and CdSe QDs. The Fig. S1c exhibits the IR spectrum of STO, in which the vibrational band at 632.40 cm^{-1} corresponds to the stretching vibration of Sr-O and weak peak at 428.36 cm^{-1} is due to the Ti-O bending vibration.[S2] Another functional group, namely, carbonyl group in MPA is attached with STO. The peak associated for –OH stretching at 3417 cm^{-1} in MPA (Fig. S1a) is suppressed in MPA capped

CdSe QDs loaded on STO (Figure S1d) and C=O stretching is shifted from 1718 to 1575 cm^{-1}, which (Fig. S1a and d) confirms the bonding between –COOH carbonyl group and STO.[S1]

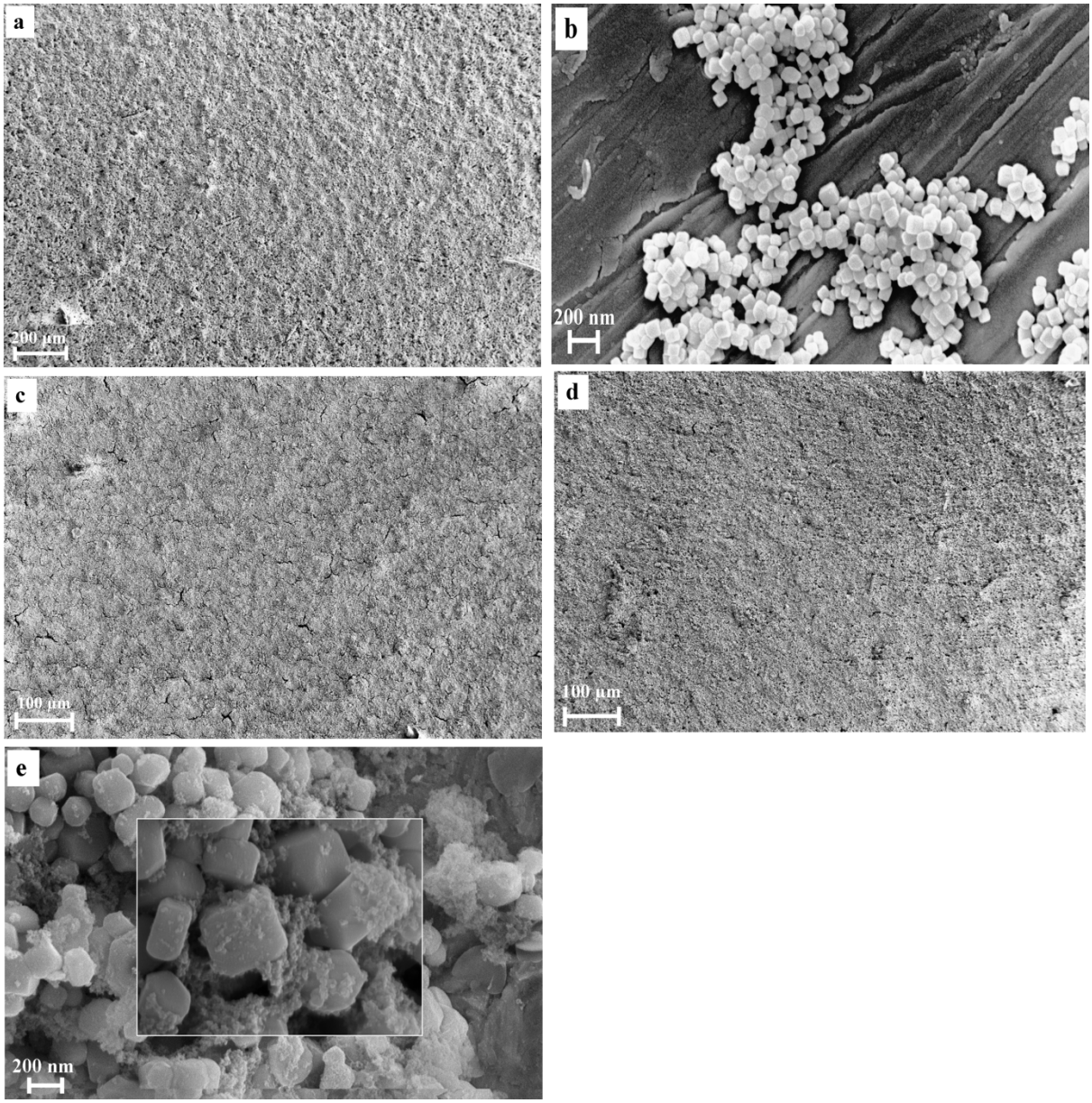

Fig. S2 FESEM images of STO (a,b), QDs (c) and QDs-STO (d,e) photo electrodes.

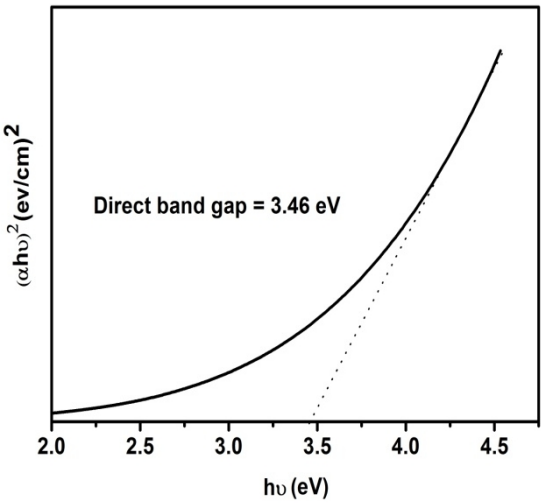

Fig. S3 Tauc Plot for STO photo electrode.

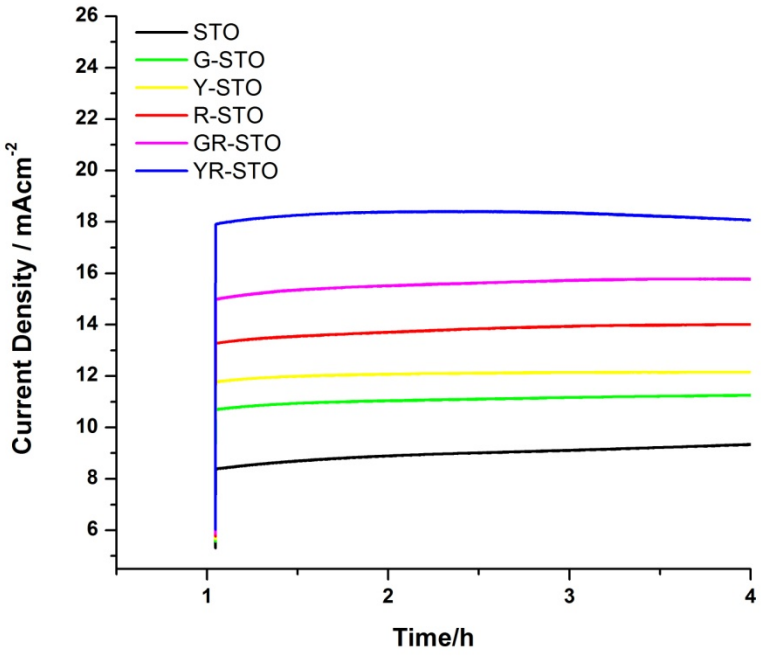

Fig. S4 i-t curves of STO and CdSe sensitized STO photo electrode under illumination condition.

References

S1 J. Huang, S. Liu, L. Kuang, Y. Zhao, T. Jiang, S. Liu and X. Xu, *J. Environ. Sci*., 2013, **25**, 2487.

S2 P. Jayabal, V. Sasirekha, J. Mayandi, K. Jeganathan and V. Ramakrishnan, *J. Alloys Compd*., 2014, **586**, 456.