# Supporting Information

# Controllable coverage of $Bi_2S_3$ quantum dots on one-dimensional $TiO_2$ nanorod arrays by pulsed laser deposition technique for high photoelectrochemical properties

Minmin Han[a,b], Hongjian Guo[a,b], Bo Li[a], Junhong Jia[a,*], Wenzhen Wang[a]

[a] State Key Laboratory of Solid Lubrication, Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences, Lanzhou, 730000, P. R. China.

[b] University of Chinese Academy of Sciences, Beijing, 100080, P. R. China.

[*] Corresponding author. Tel./Fax: +86-931-4968611.
E-mail address: jhjia@licp.cas.cn (J. Jia)

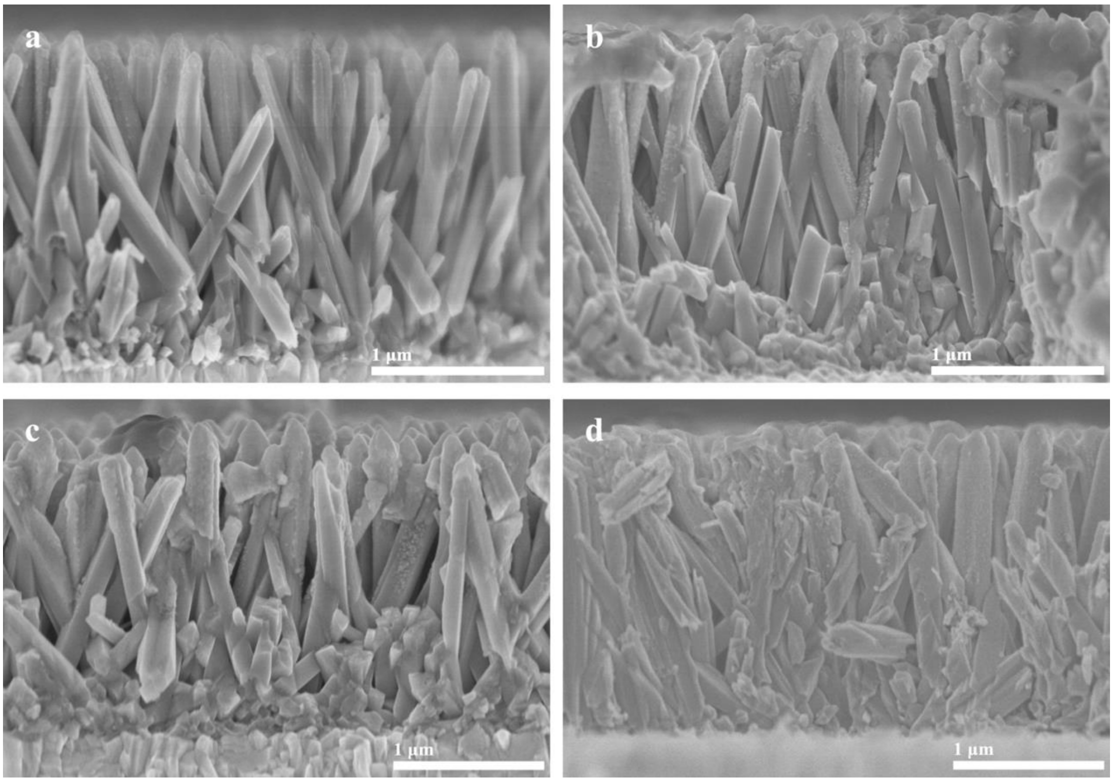


Fig. S1 Cross-section view FESEM images of (a) BS(900)/$TiO_2$, (b) BS(1800)/$TiO_2$, (c) BS(2700)/$TiO_2$ and (d) BS(3600)/$TiO_2$.

Fig. S1 shows the cross-section view FESEM images of BS(*n*)/$TiO_2$ photoelectrode. As the laser ablation pulse (*n*) increases, the coverage of QDs on the nanorods increases. When the QDs are deposited with low value of *n*, there are few QDs on the surface of $TiO_2$ nanorods (Fig. S1a and b). With the increase of *n*, the size and quantity of QDs increases and the top of $TiO_2$ nanorods become domed particles (Fig. S1c). While further increasing the value of *n*, the nanorods thicken obviously and the porosity between nanorods decreases (Fig. S1d). This result is consistent with the SEM images of the surface for BS(*n*)/$TiO_2$ photoelectrodes in Fig. 1, which indicates that the coverage of QDs on the surface of nanorods is able to be adjusted by the PLD technique.

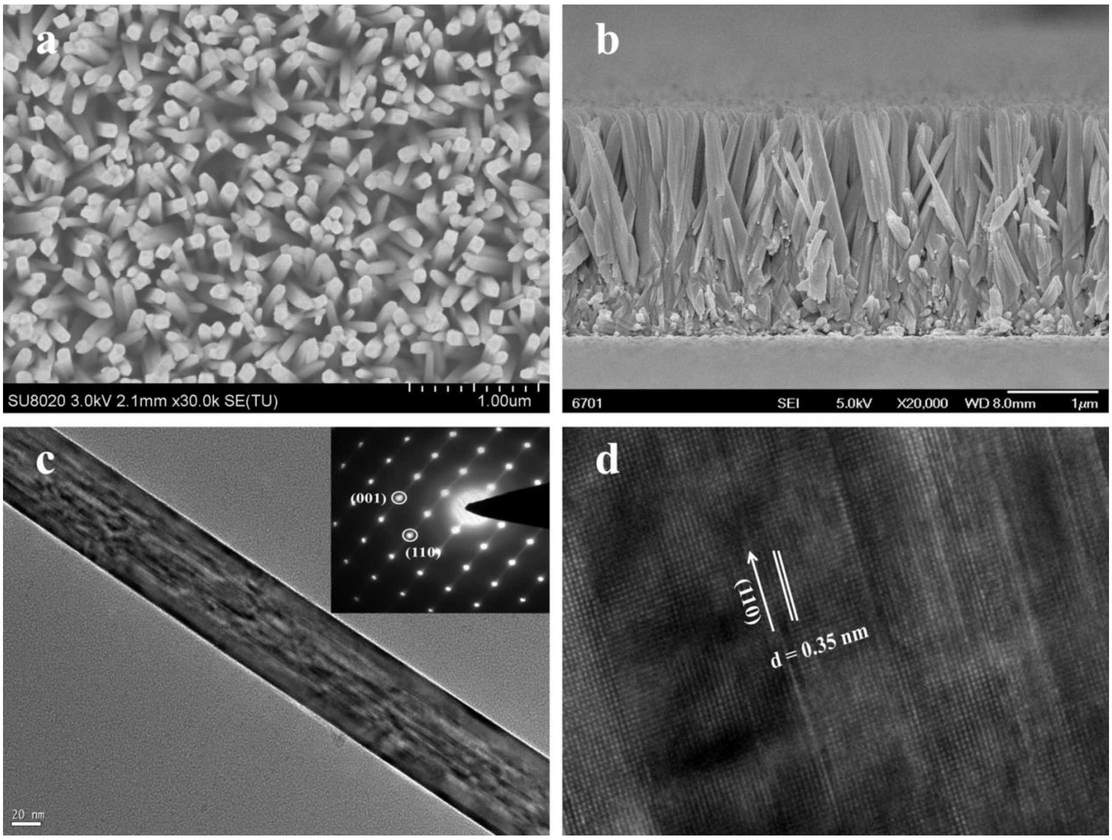


Fig. S2 (a) Top-view and (b) cross-section view FESEM images of $TiO_2$ nanorod arrays. (c) TEM and (d) HRTEM images of $TiO_2$ nanorod arrays, the inset in (c) shows the SAED pattern of $TiO_2$ nanorod arrays.

Fig. S2a shows the top-view FESEM image of plain $TiO_2$ nanorod arrays. With an obvious porosity between them, $TiO_2$ nanorods grow uniformly all over the FTO substrate. From the cross-sectional view, it can be clearly seen that the $TiO_2$ nanorods are vertically aligned and the length of $TiO_2$ nanorods is about 2 μm. Moreover, the diameter of plain $TiO_2$ nanorod is about 110 nm (Fig. S2c). The SAED pattern and the HRTEM image confirm the single-crystalline nature of $TiO_2$ nanorods. The lattice spacing of 0.35 nm can be indexed to the (110) plane, which indicates that the nanorods grow along the (110) crystal plane with a preferred (001) orientation. The XRD spectrum presented in Figure 3a also confirms that the $TiO_2$ nanorods are single crystalline and can be classified as tetragonal rutile phase (JCPDS file no. 21-1276) since all the diffraction peaks well match rutile phase.