Supporting Information

Controllable coverage of Bi$_2$S$_3$ quantum dots on one-dimensional TiO$_2$ nanorod arrays by pulsed laser deposition technique for high photoelectrochemical properties

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Fig. S1 shows the cross-section view FESEM images of BS(n)/TiO₂ 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 TiO₂ nanorods (Fig. S1a and b). With the increase of n, the size and quantity of QDs increases and the top of TiO₂ 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)/TiO₂ 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.