

Electronic Supplementary Material

A new TiO₂ nanorods/MoTe₂ quantum dots/Al₂O₃ composite photocatalyst for efficient photoelectrochemical water splitting under simulated sunlight

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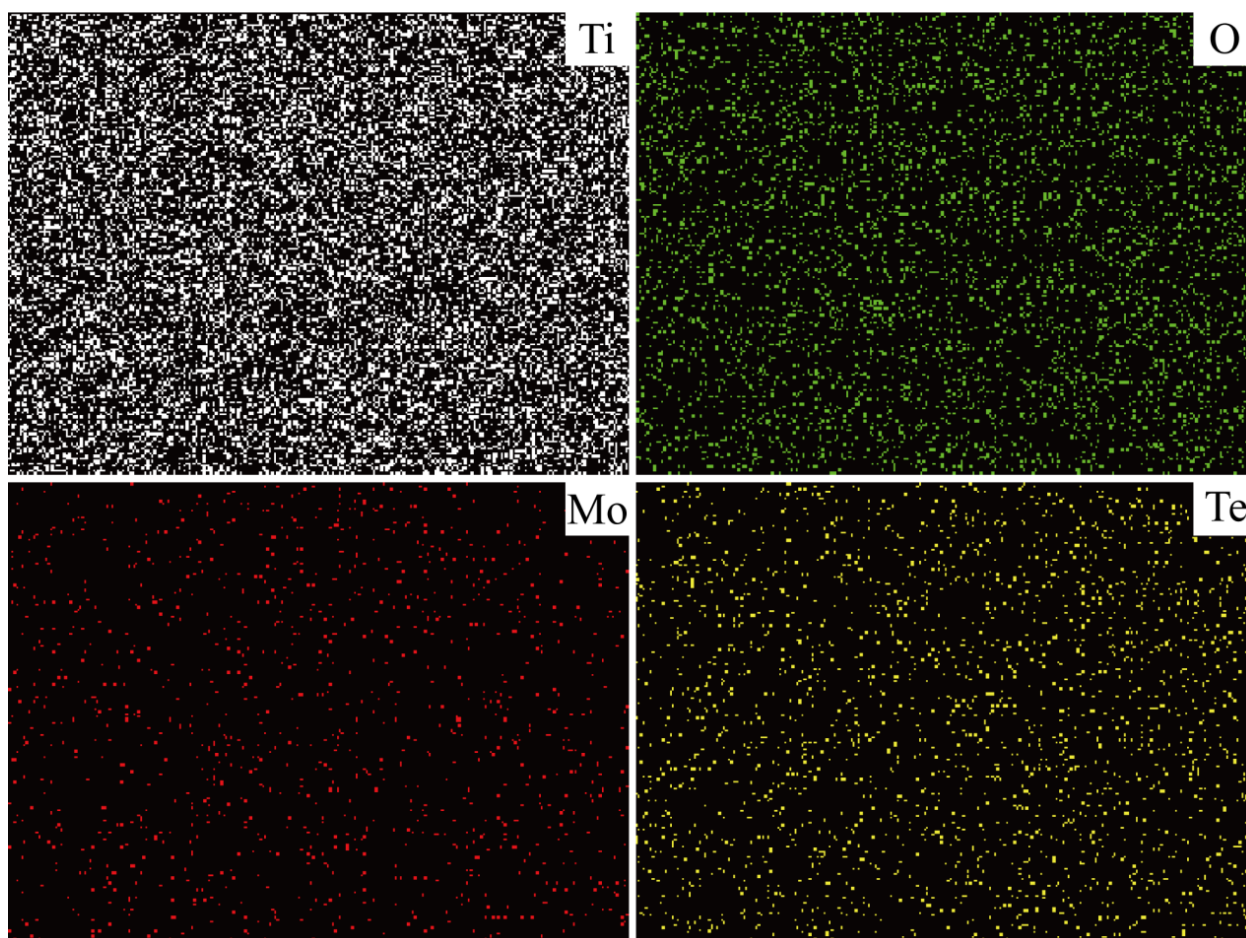


Fig. S1 Corresponding EDS mappings of Ti, O, Mo, and Te elements in TiO₂ NRs/MoTe₂ QDs.

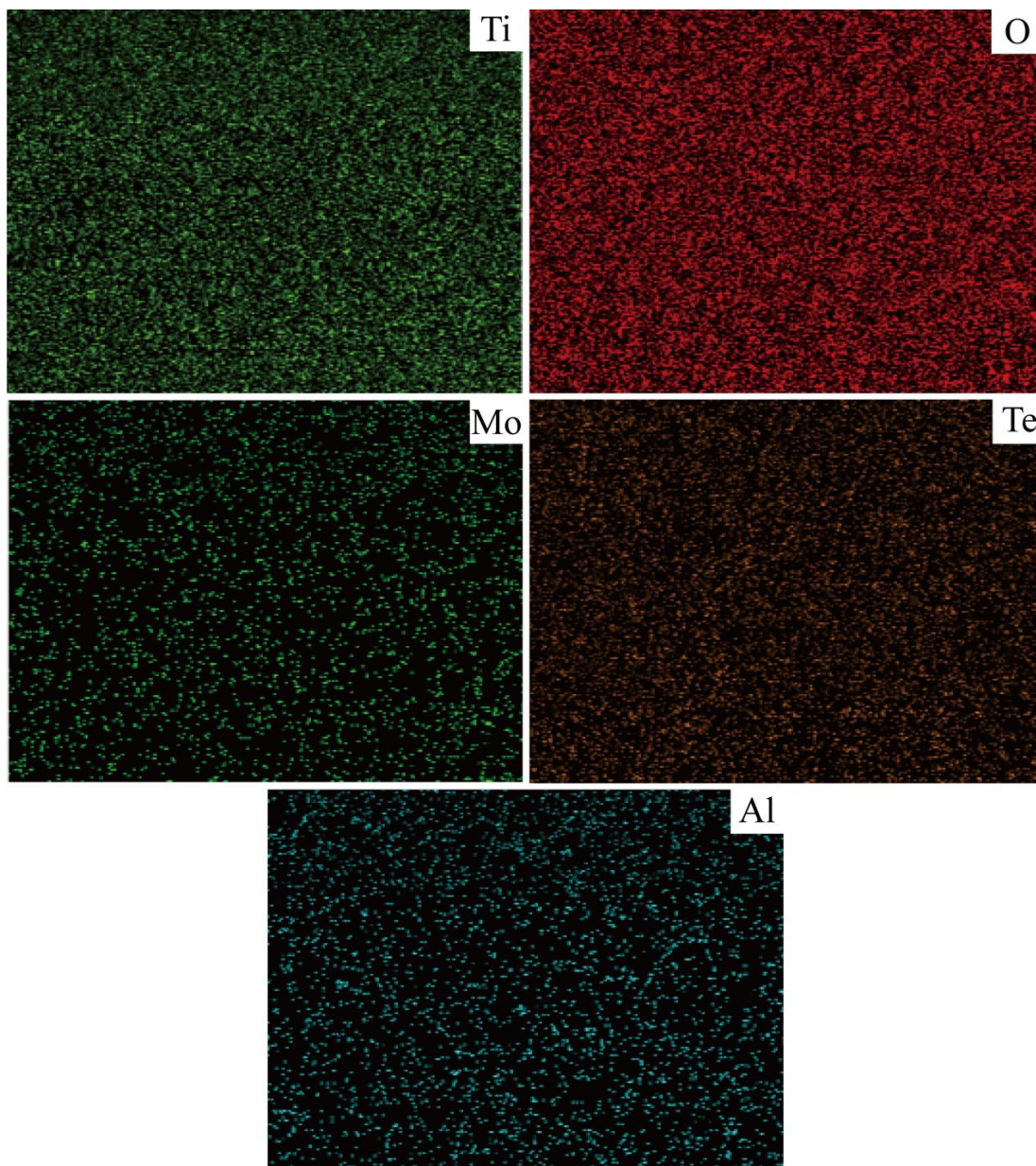


Fig. S2 Corresponding EDS mappings of Ti, O, Mo, and Te elements in TiO₂ NRs/MoTe₂ QDs/Al₂O₃.

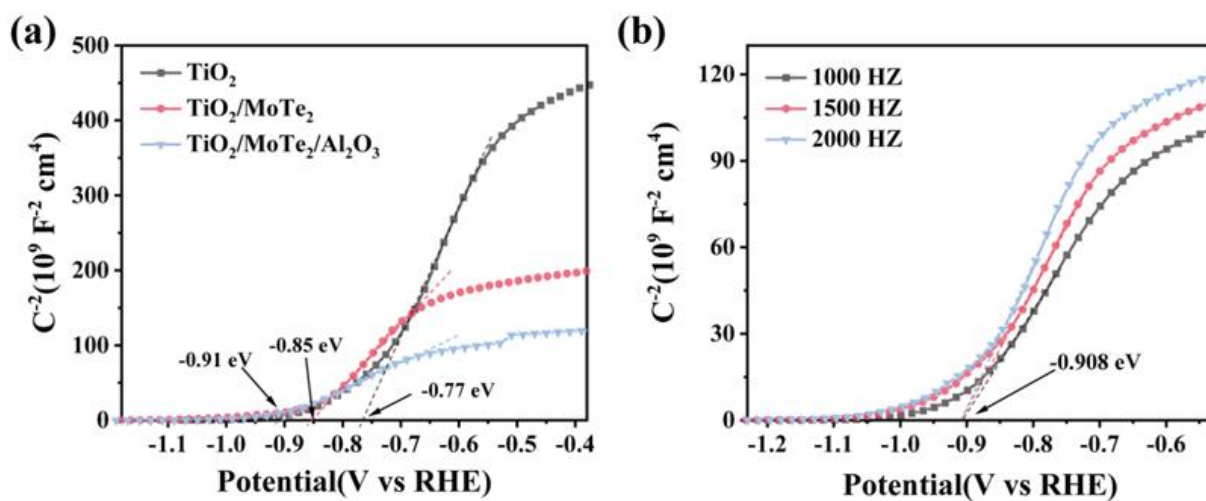


Fig. S3 (a) Mott-Schottky plots of TiO₂ NRs, TiO₂ NRs/MoTe₂ QDs, and TiO₂ NRs/MoTe₂ QDs/Al₂O₃. (b) Mott-Schottky plots of TiO₂ NRs/MoTe₂ QDs/Al₂O₃ at different frequencies.

A band structure diagram can be drawn based on following data: For MoTe₂ QDs, Fig. 4(a) shows the band gap of 1.69 eV, while Fig. 4(b) shows the VB potential of 0.51 eV and the calculated CB potential of -1.18 eV. For TiO₂ NRs, Fig. 4(d) exhibits the band gap of 2.99 eV. In addition, the Mott–Schottky curves for TiO₂ NRs, TiO₂ NRs/MoTe₂ QDs, and TiO₂ NRs/MoTe₂ QDs/Al₂O₃ are depicted in Fig. S3(a), from which it can be obtained that their flat-band potentials are -0.77, -0.85, and -0.91 eV, respectively. As described in previous work, it is generally believed that for a semiconductor, its CB potential is 0.2 eV larger than its flat-band potential. Thus, the CB potentials of those semiconductors are -0.57, -0.65, and -0.71 eV, respectively, and the VB potential of TiO₂ NRs is further determined to be 2.42 eV. Based on the amalgamation of aforementioned data, Fig. 8 can be delineated.

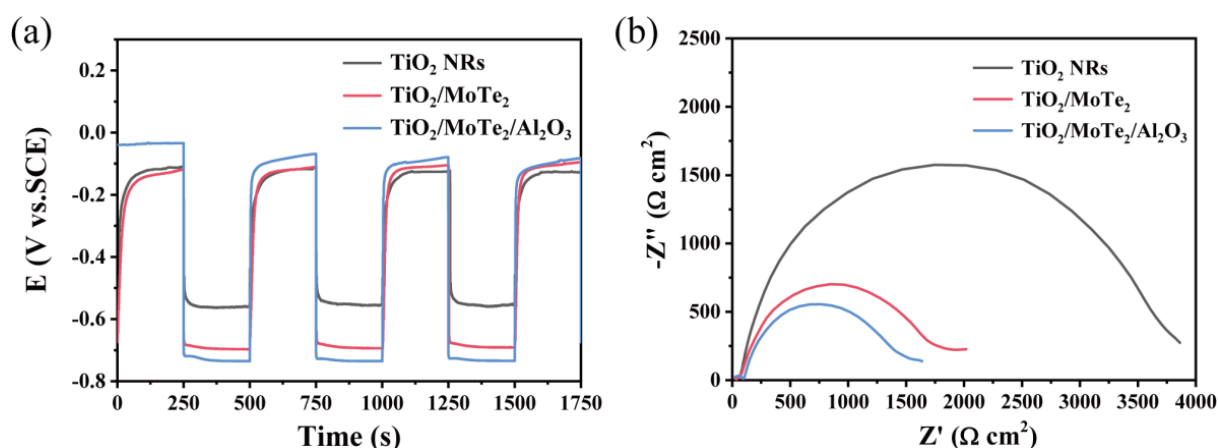


Fig. S4 (a) Photo-induced OCP variations and (b) electrochemical impedance spectroscopy (EIS) results of TiO₂ NRs, TiO₂ NRs/MoTe₂ QDs, and TiO₂ NRs/MoTe₂ QDs/Al₂O₃ photoelectrodes.

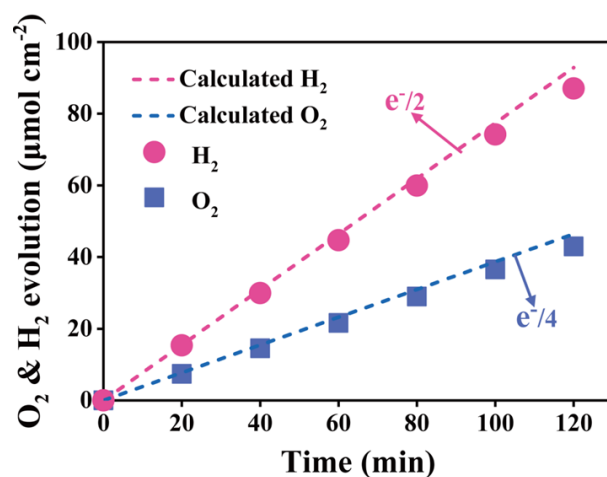


Fig. S5 Amounts of oxygen and hydrogen evolving from TiO₂ NRs/MoTe₂ QDs/Al₂O₃ photoanodes, as determined by gas chromatography.