

Supporting information

Flame Reduced TiO₂ Nanorod Arrays with Ag Nanoparticle Decoration for Efficient Solar Water Splitting

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The preparation of BiVO₄ photoanodes

The preparation of BiVO₄ photoanodes is based on steps for electrodepositing BiOI photoanodes following calcining at high temperature.^{S1} Typically, A 0.04 M Bi(NO₃)₃ solution was prepared by dissolving Bi(NO₃)₃·5H₂O in 50 mL of a 0.4 M KI solution after its pH was adjusted to 1.7 by adding HNO₃. This solution was mixed with 20 mL of absolute ethanol (100%) containing 0.23 M *p*-benzoquinone and was vigorously stirred for a few minutes. A typical three-electrode cell was used for electrodeposition. A fluorine-doped tin oxide (FTO) working electrode (WE), Ag/AgCl (saturated KCl) reference electrode (RE), and a platinum counter electrode (CE) were used. The CHI 852C electrochemical workstation was used for electrodeposition. The cathodic deposition was performed potentiostatically at -0.1 V vs. Ag/AgCl at RT with 5 min.

0.15 - 0.2 mL of a dimethyl sulfoxide (DMSO) solution containing 0.2 M vanadyl acetylacetonate (VO(acac)₂) was placed on the BiOI electrode and was heated in a muffle

furnace at varying temperatures (450 °C) and for 2 h in air to convert BiOI to BiVO₄. Excess V₂O₅ present in the BiVO₄ electrodes was removed by soaking them in 1 M NaOH solution for 30 min with gentle stirring. The resulting pure BiVO₄ electrodes were rinsed with DI water and dried at an oven.

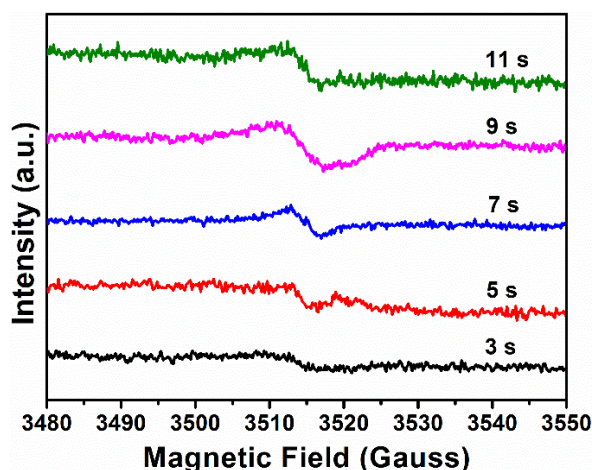


Figure S1. The EPR spectra of TiO₂-FR at different reduction time (3 – 11 s).

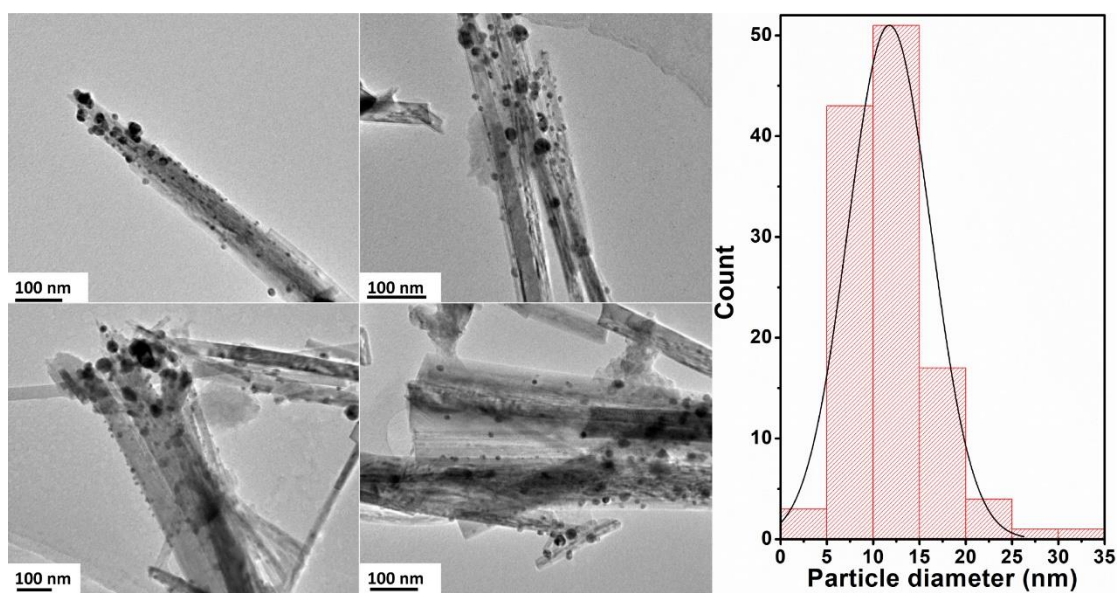


Figure S2. The TEM views of Ag-TiO₂-FR 7 s and the size distribution of Ag nanoparticles.

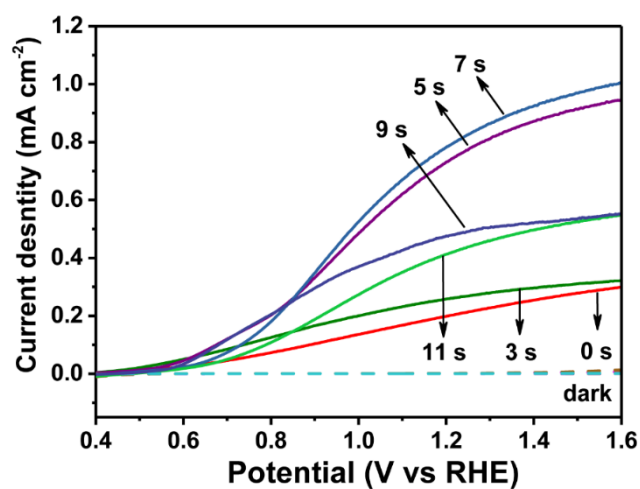


Figure S3. The J - V curves for TiO₂ with different flame reduction time (0 – 11 s).

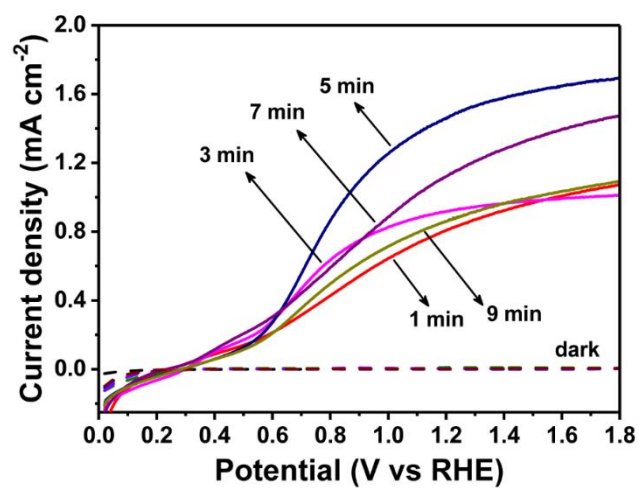


Figure S4. The J - V curves for TiO₂ – FR 7 s with PEC cathodic reduction AgNO₃ at different times (1 – 9 min).

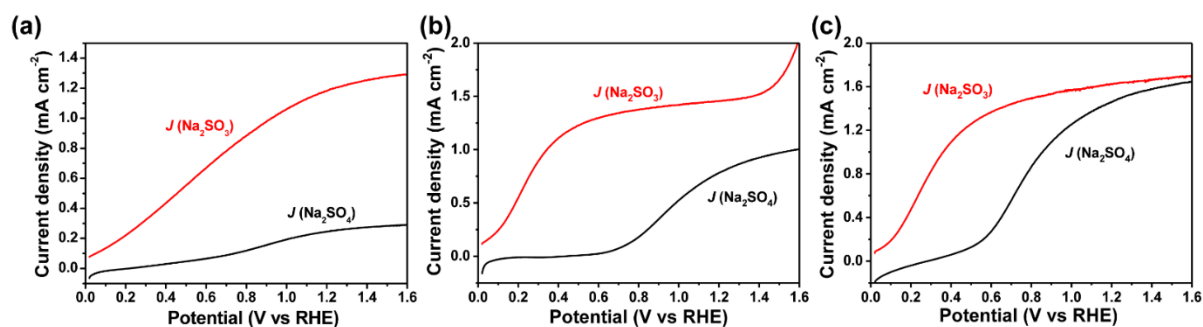


Figure S5. The J - V curves under the conditions of 0.5 M Na₂SO₄ containing 0.5 M Na₂SO₃ for (a) pristine TiO₂, (b) TiO₂-FR 7 s, (c) Ag-TiO₂-FR 7 s.

References

(S1) Kim, T. W.; Choi, K. S. Nanoporous BiVO₄ Photoanodes with Dual-Layer Oxygen Evolution Catalysts for Solar Water Splitting. *Science* **2014**, *343*, 990-994.