

Electronic Supplementary Information

A drastic improvement in photocatalytic H₂ production by TiO₂ nanosheets grown directly on Ta₂O₅ substrates

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Fig. S1. (a, c) Top-view FE-SEM images of Ta₂O₅/TiO₂ NS (1- μ m-thick), (b, d) Ta₂O₅/TiO₂ NS (2.5- μ m-thick), insert SEM images shows sheet thickness of Ta₂O₅/TiO₂ NS (1- μ m-thick) (c), and Ta₂O₅/TiO₂ NS (2.5- μ m-thick) (d).

Fig. S2 Wide survey XPS spectra of the as-formed and annealed (2- μ m-thick) TiO₂ NSs on Ta₂O₅ and FTO substrates.

Fig. S3 The optical direct (Ta₂O₅) and indirect (TiO₂) band gaps calculated from diffuse reflectance measurements using the Tauc plot for annealed (a) Ta/Ta₂O₅ and (b) 2- μ m-thick FTO/TiO₂ NSs.

Fig. S4 Still digital and corresponding HR-SEM images of (a) as-formed and (b) after 24 h of H₂ production by Ta₂O₅/TiO₂ NS (2- μ m-thick) sample. (c) XRD spectra of the annealed TiO₂ NS arrays (2- μ m-thick) prepared on Ta₂O₅ before and after 24 h H₂ production process.

Table S1. Layer thickness, average sheet thickness, average sheet width, and percentage of {001} facets of annealed TiO₂ NS arrays with varying thicknesses on FTO and Ta₂O₅ substrates.

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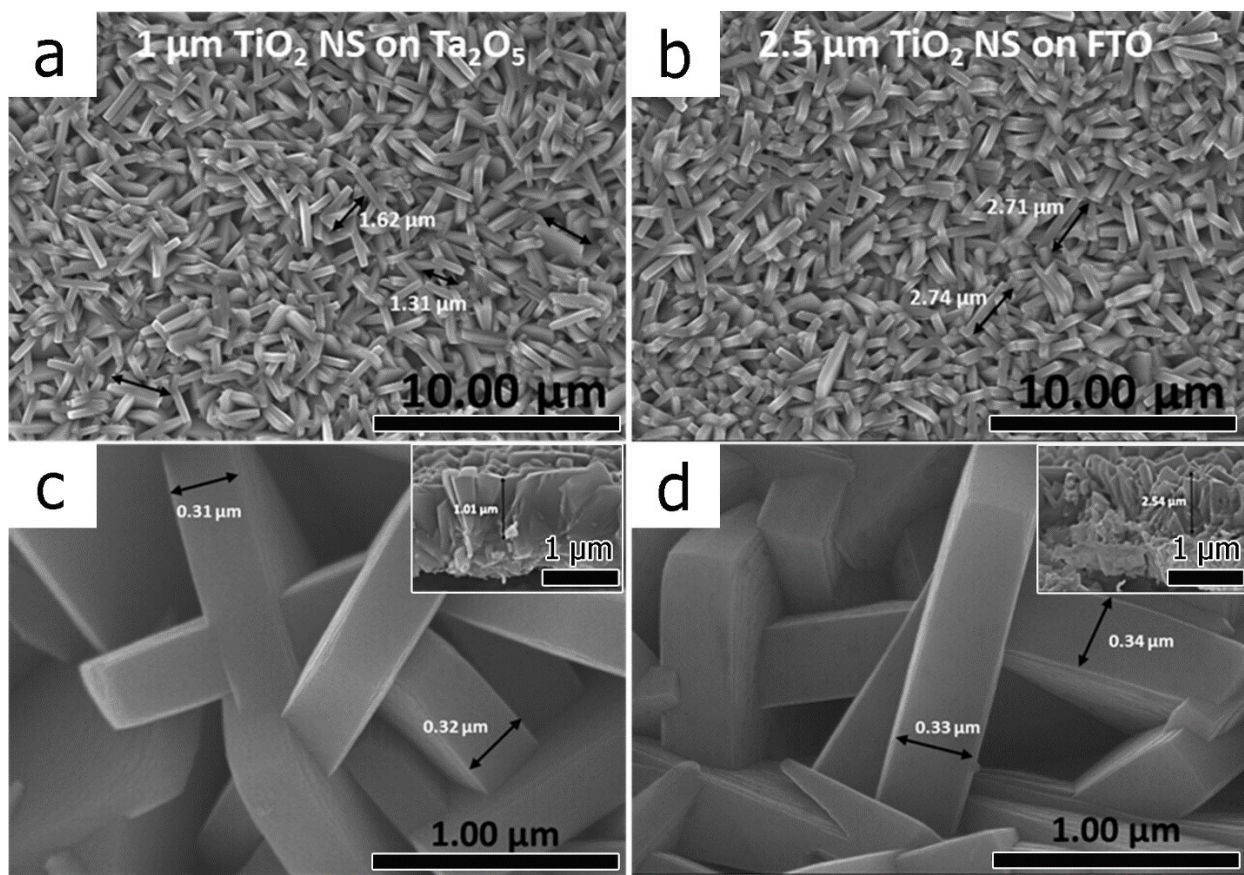


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Table S1. Layer thickness, average sheet thickness, average sheet width, and percentage of {001} facets of annealed TiO₂ NS arrays with varying thicknesses on FTO and Ta₂O₅ substrates.

Sample	Layer thickness (μ m)	Average sheet thickness (μ m)	Average sheet width (μ m)	Percent {001} (%)
FTO/TiO ₂ NS (2- μ m-thick)	2.02	0.335	2.245	73.95
Ta ₂ O ₅ /TiO ₂ NS (1- μ m-thick)	1.01	0.315	1.465	65.37
Ta ₂ O ₅ /TiO ₂ NS (2- μ m-thick)	2.04	0.340	2.250	73.68
Ta ₂ O ₅ /TiO ₂ NS (2.5- μ m-thick)	2.54	0.335	2.725	77.80

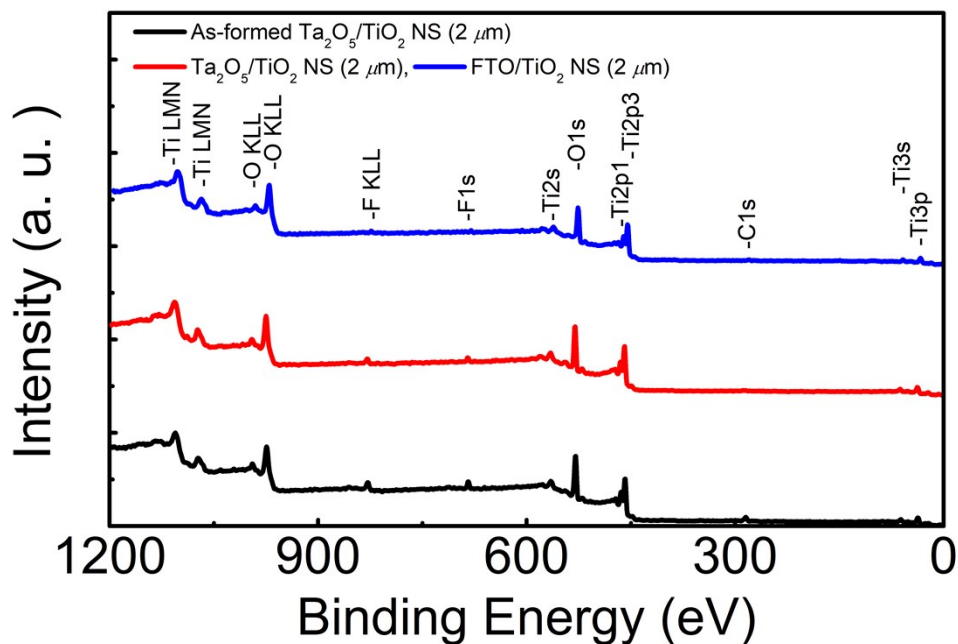


Fig. S2 Wide survey XPS spectra of the as-formed and annealed (2- μm -thick) TiO_2 NSs on Ta_2O_5 and FTO substrates.

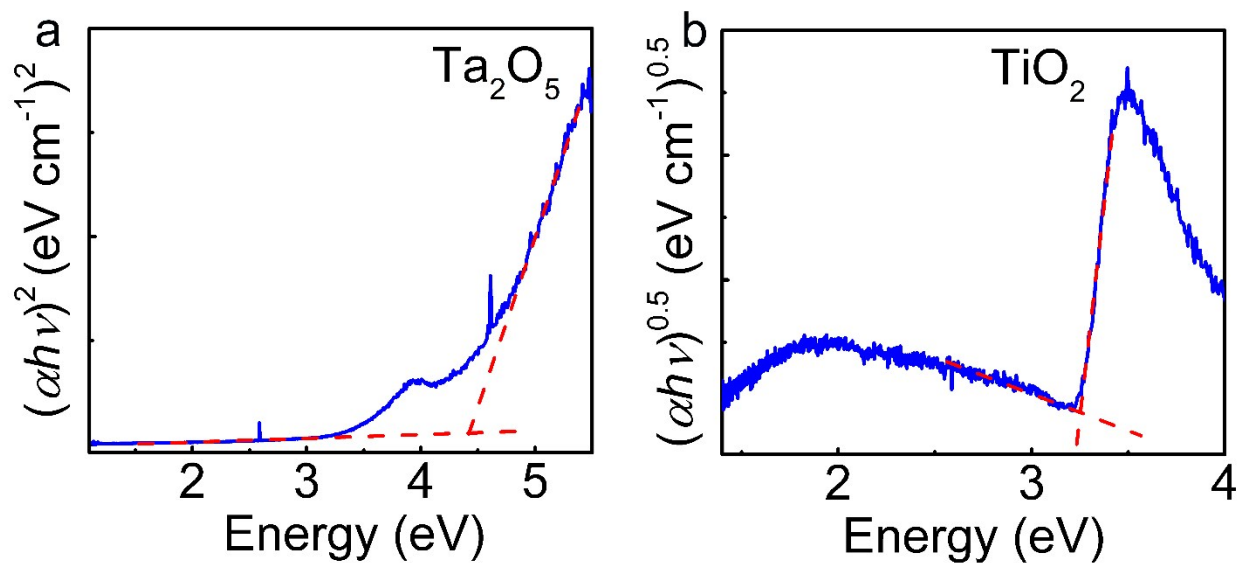


Fig. S3 The optical direct (Ta_2O_5) and indirect (TiO_2) band gaps calculated from diffuse reflectance measurements using the Tauc plot for the annealed (a) $\text{Ta}/\text{Ta}_2\text{O}_5$ and (b) 2- μm -thick FTO/TiO_2 NSs.

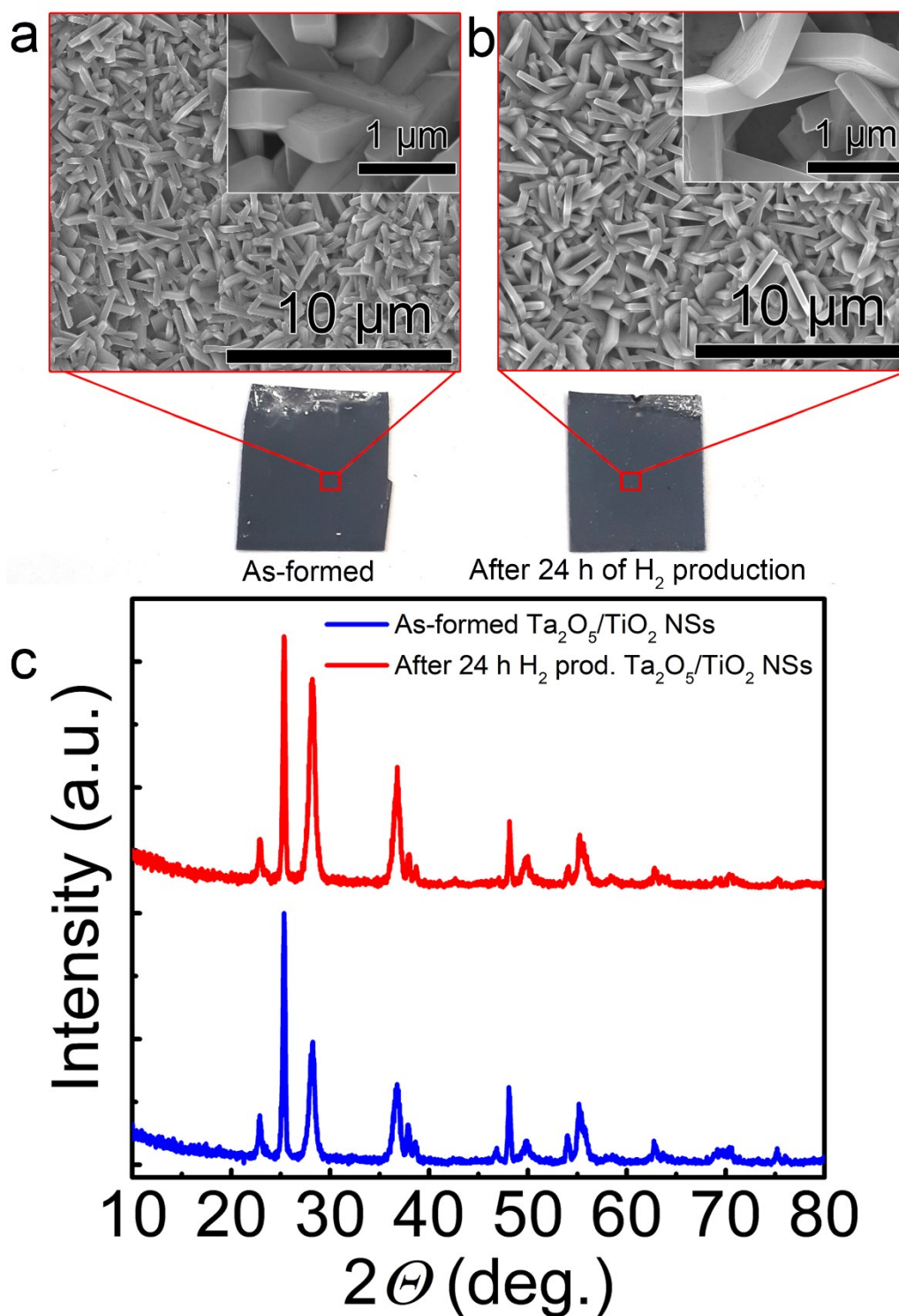


Fig. S4 Still digital and corresponding HR-SEM images of (a) as-formed and (b) after 24 h of H₂ production by Ta₂O₅/TiO₂ NS (2-μm-thick) sample. (c) XRD spectra of the annealed TiO₂ NS arrays (2-μm-thick) prepared on Ta₂O₅ before and after 24 h H₂ production process.