

## Supporting Information

### **Non-noble metal plasmonic photocatalysis in semimetal bismuth films for photocatalytic NO oxidation**

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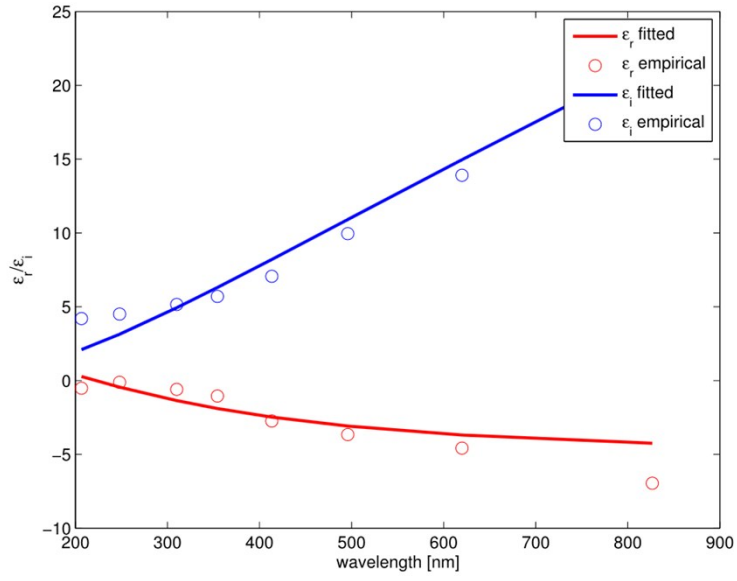
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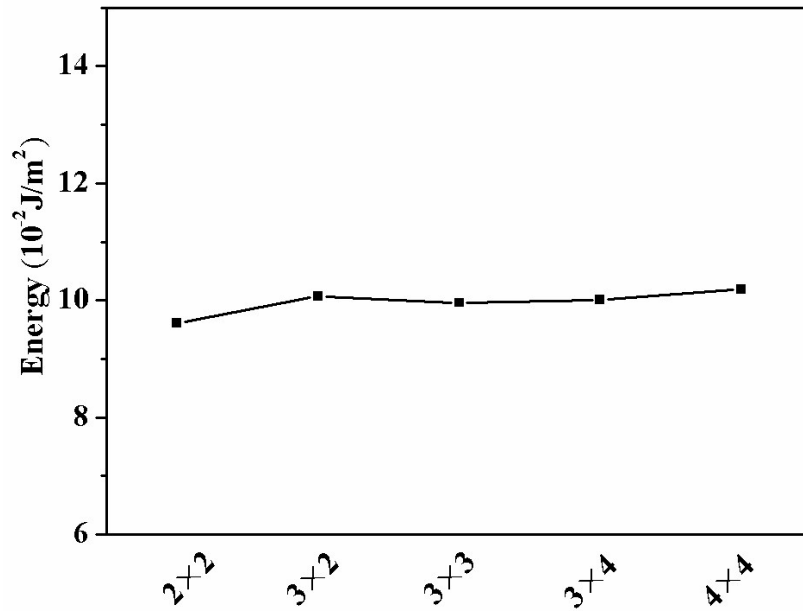
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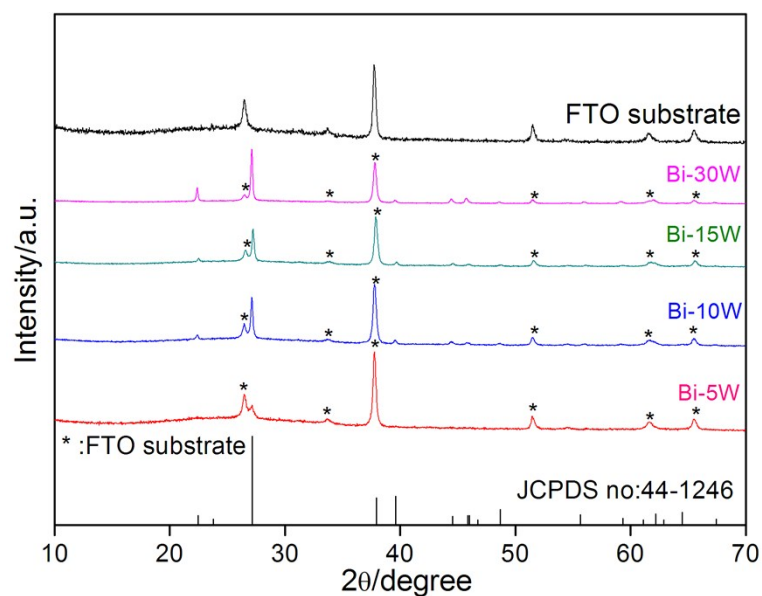
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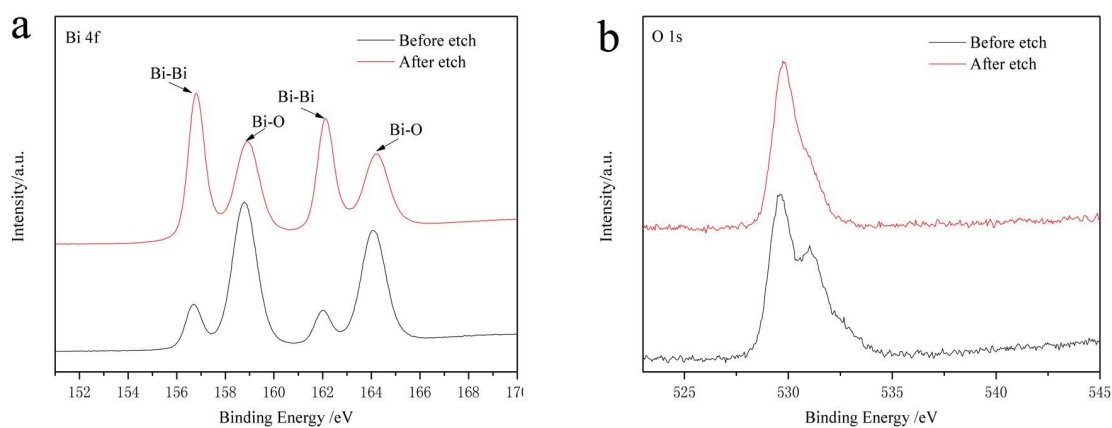
**Fig. S1** Empirical dielectric constant data and the fitted dielectric function with Drude model for Bi



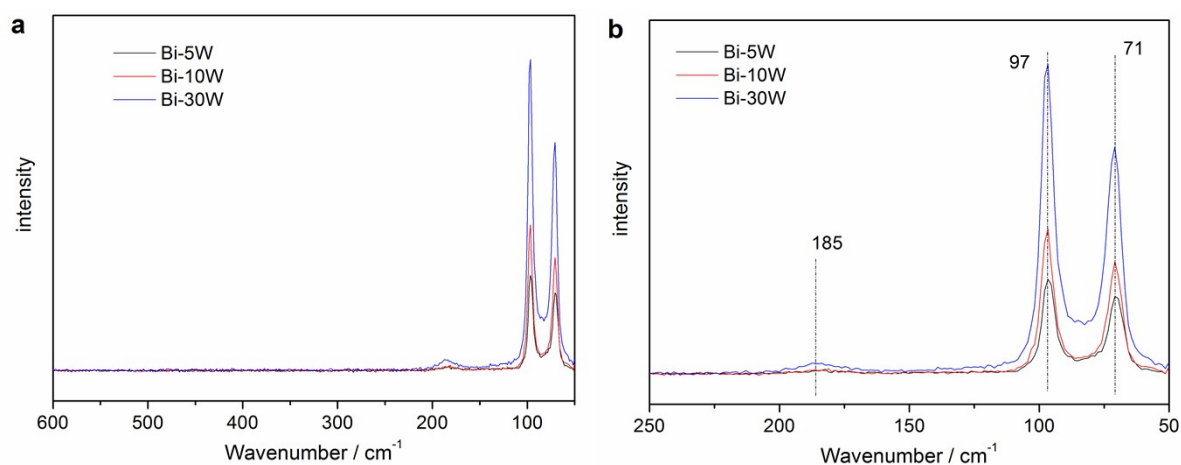
**Fig. S2** The surface energy convergence tests of Bismuth surface.



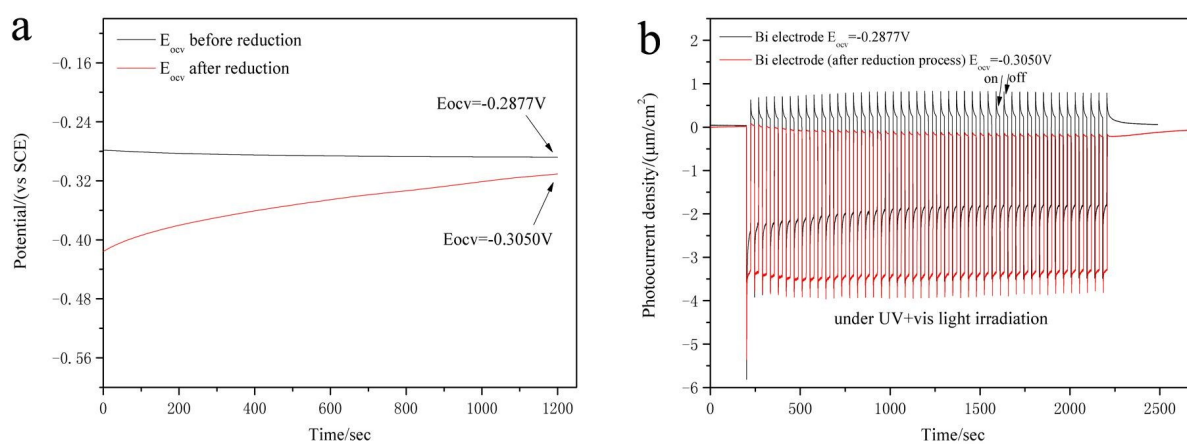
**Fig. S3** PXRD patterns of Bi films prepared at different conditions (Bi-5W, Bi-10W, Bi-15W, Bi-30W) and the FTO substrate.



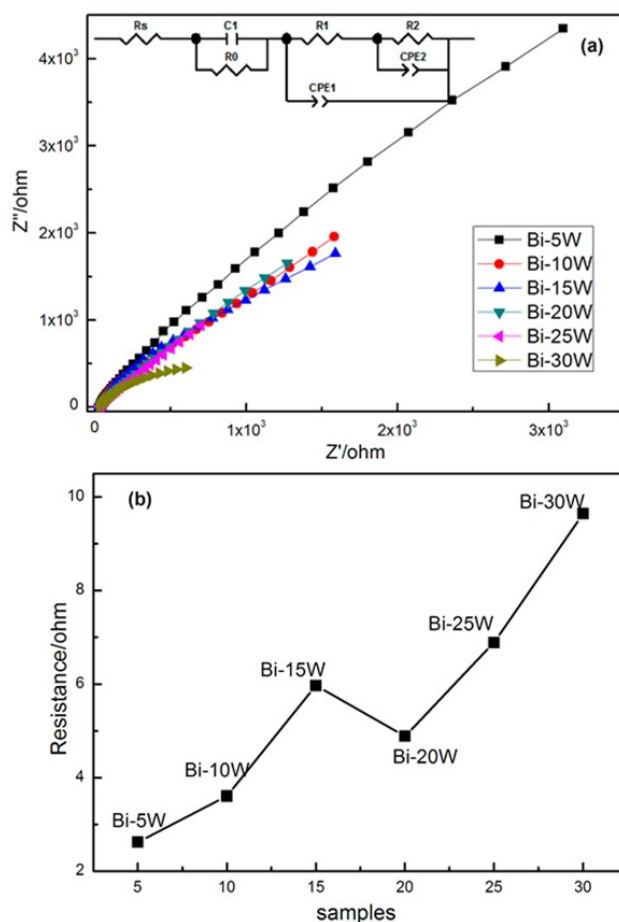
**Fig. S4** (a) Bi 4f and (b) O 1s XPS spectra of Bi particles before and after ion etching.



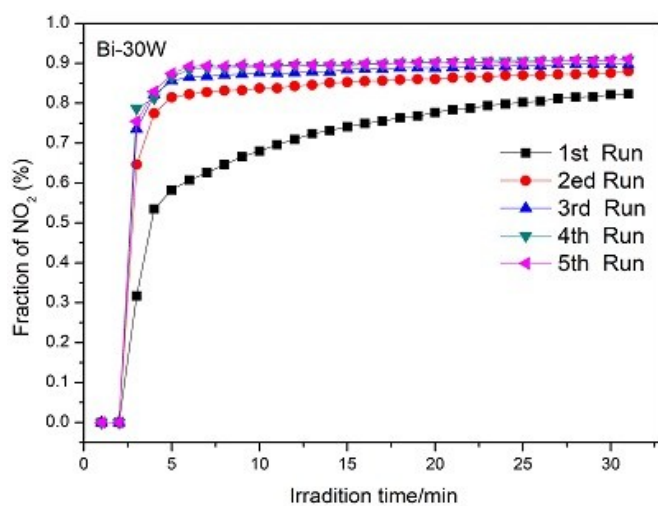
**Fig.S5** Raman spectroscopy of Bi-5W, Bi-10W and Bi-30W



**Fig. S6** (a) Open Circuit Voltage for the Bi-5W before and after electrochemical reduction in 0.5M  $\text{Na}_2\text{SO}_4$  solution; (b) the photocurrent-time curve for Bi-5W before and after reduction at OCV under UV-vis light irradiation

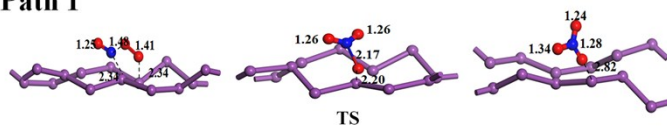


**Fig. S7** (a) The electrochemistry impedance spectroscopy (EIS) of different Bi films tested in 0.5M  $\text{Na}_2\text{SO}_4$  solution at Open Circuit Voltage (OCV) in dark, the insert is the EEC; (b) the resistance value ( $R_0$ ) of different Bi films calculated from the EEC parameters.

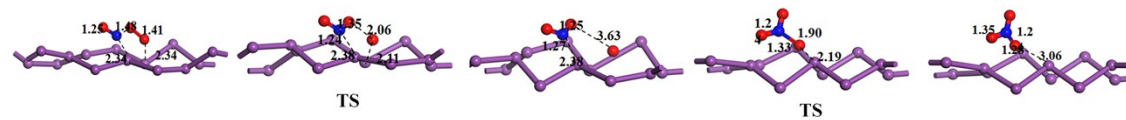


**Fig. S8** Monitoring of the fraction of  $\text{NO}_2$  intermediate over Bi film

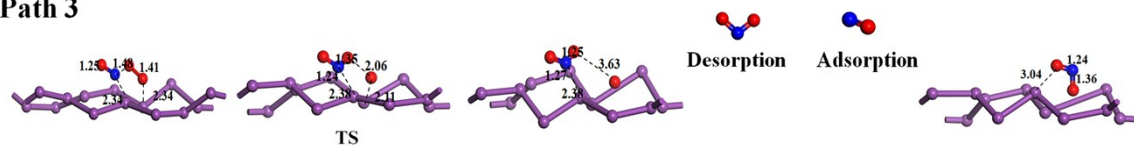
### Path 1



### Path 2



### Path 3



**Fig. S9** The structures corresponding to the reaction path followed by the NO oxidation mechanism on the Bi surface. All lengths are given in Å.

**Table S1** The amount of charge transfer ( $\Delta q$ ) of reactions, products and transition states. (Numerical values are given in units of e.)

Path	Reaction 1	TS 1	Product 1	Reaction 2	TS 2	Product 2
1	0.78	1.30	0.56	--	--	--
2	0.78	1.11	1.42	1.42	0.36	0.65
3	0.78	1.11	1.42	0.52	0.52	0.52