Supporting Information

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

Ying Zhou*ab, Wei Li,a Qian Zhang,a Shuai Yan,c Yuehan Cao,a Fan Dong,*ad and Fang Wanga

a) The Center of New Energy Materials and Technology, School of Materials Science and Engineering, Southwest Petroleum University, Chengdu 610500, China
b) State Key Laboratory of Oil and Gas Reservoir and Exploitation, Southwest Petroleum University, Chengdu 610500, China
c) Institute of Microelectronics, Chinese Academy of Sciences, Beijing 100029, China
d) College of Environmental and resources, Chongqing Technology and Business University, Chongqing 400067, China

*To whom correspondence should be addressed

Email: yzhou@swpu.edu.cn (Y. Zhou); dfctbu@126.com (F. Dong)
**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 Na$_2$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 Na$_2$SO$_4$ solution at Open Circuit Voltage (OCV) in dark, the insert is the EEC; (b) the resistance value (Ro) of different Bi films calculated from the EEC parameters.

Fig. S8 Monitoring of the fraction of NO$_2$ intermediate over Bi film
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.)

<table>
<thead>
<tr>
<th>Path</th>
<th>Reaction 1</th>
<th>TS 1</th>
<th>Product 1</th>
<th>Reaction 2</th>
<th>TS 2</th>
<th>Product 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.78</td>
<td>1.30</td>
<td>0.56</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>0.78</td>
<td>1.11</td>
<td>1.42</td>
<td>1.42</td>
<td>0.36</td>
<td>0.65</td>
</tr>
<tr>
<td>3</td>
<td>0.78</td>
<td>1.11</td>
<td>1.42</td>
<td>0.52</td>
<td>0.52</td>
<td>0.52</td>
</tr>
</tbody>
</table>