

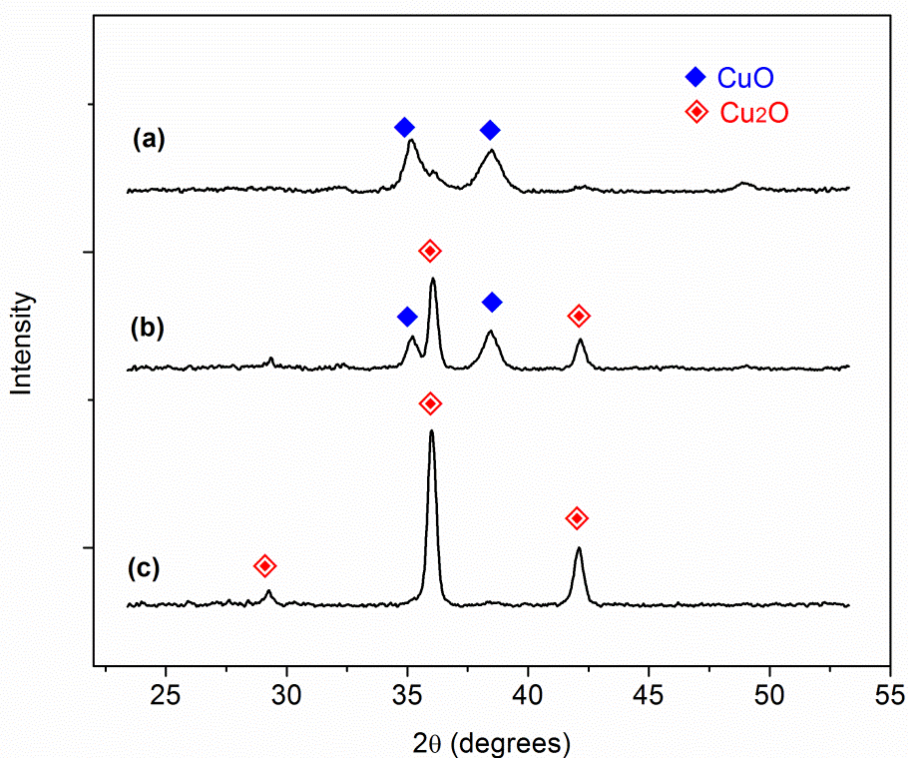
## Electronic Supplementary Information

### Sol-gel deposited $\text{Cu}_2\text{O}$ and $\text{CuO}$ thin films for photocatalytic water splitting

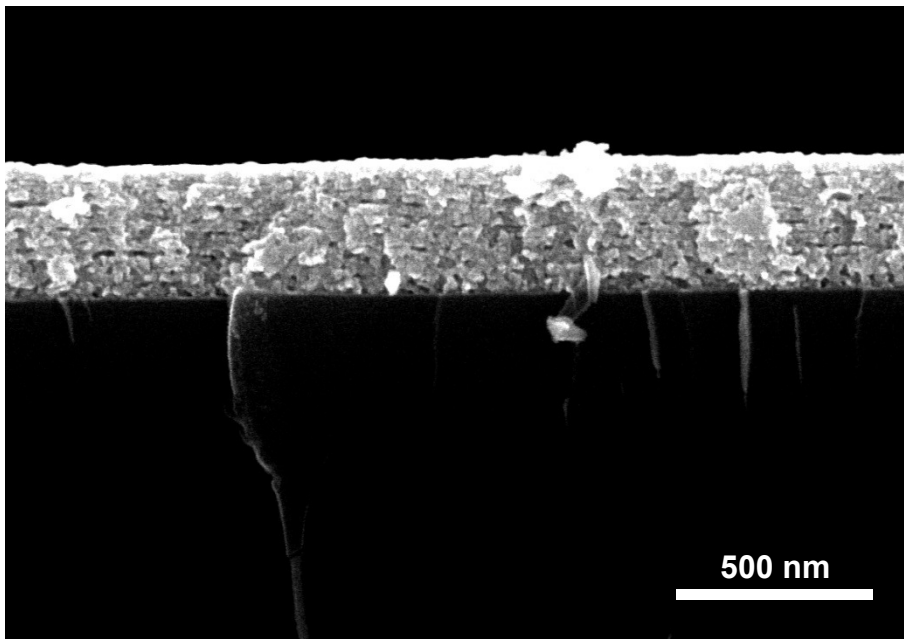
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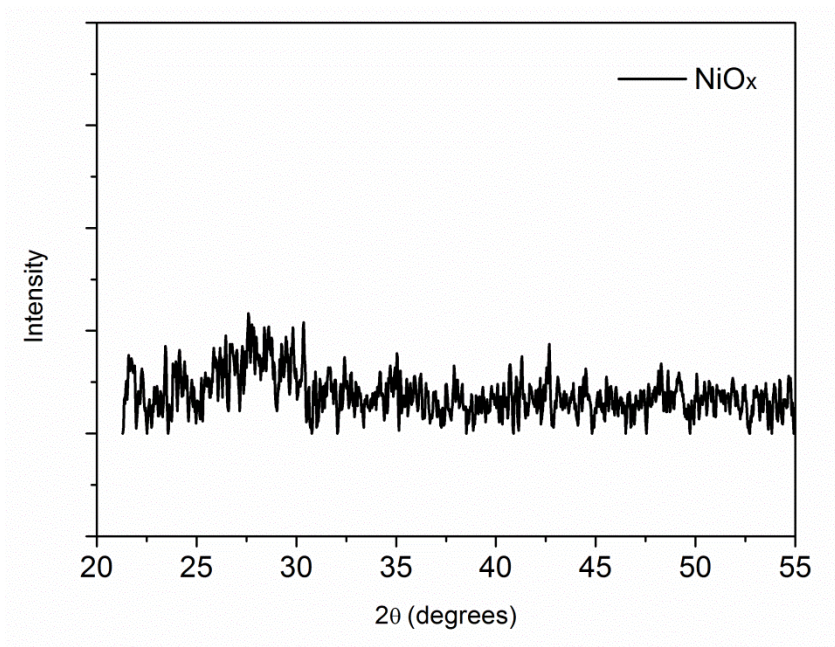
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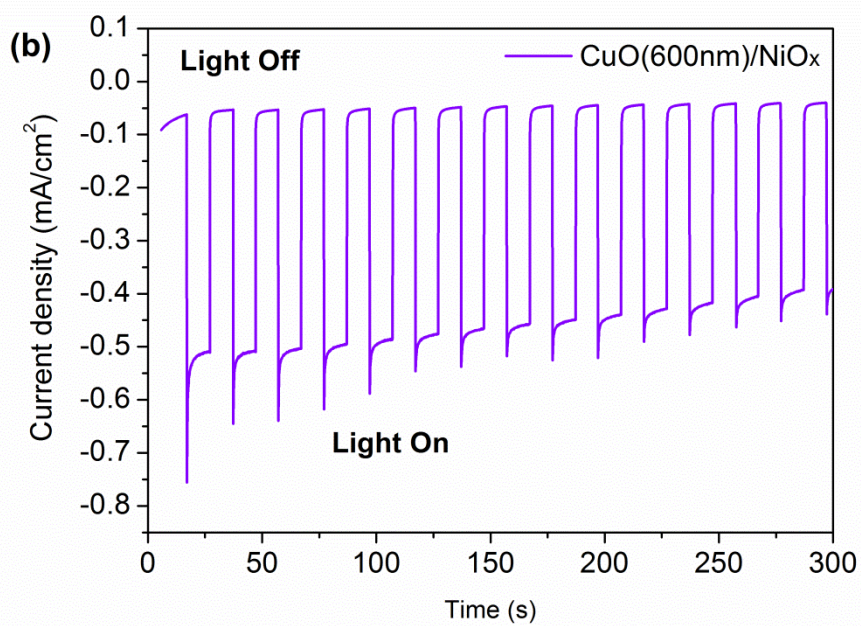
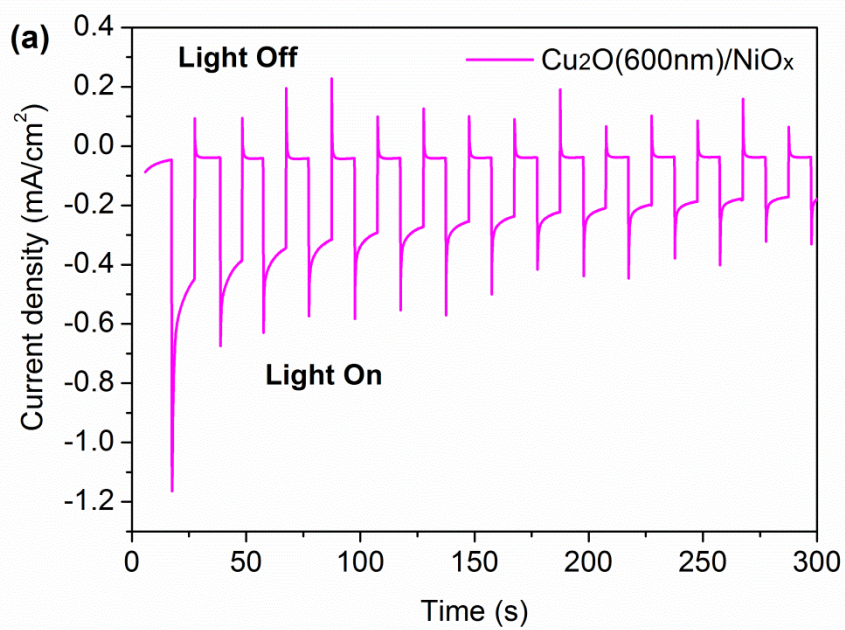
**Fig. S1** XRD spectra of 300 nm thick copper oxide thin film deposited on Si: (a) as deposited at 350 °C before final annealing; (b) annealed at 500 °C in nitrogen for 30 minutes; (c) annealed at 500 °C in nitrogen for 90 minutes.



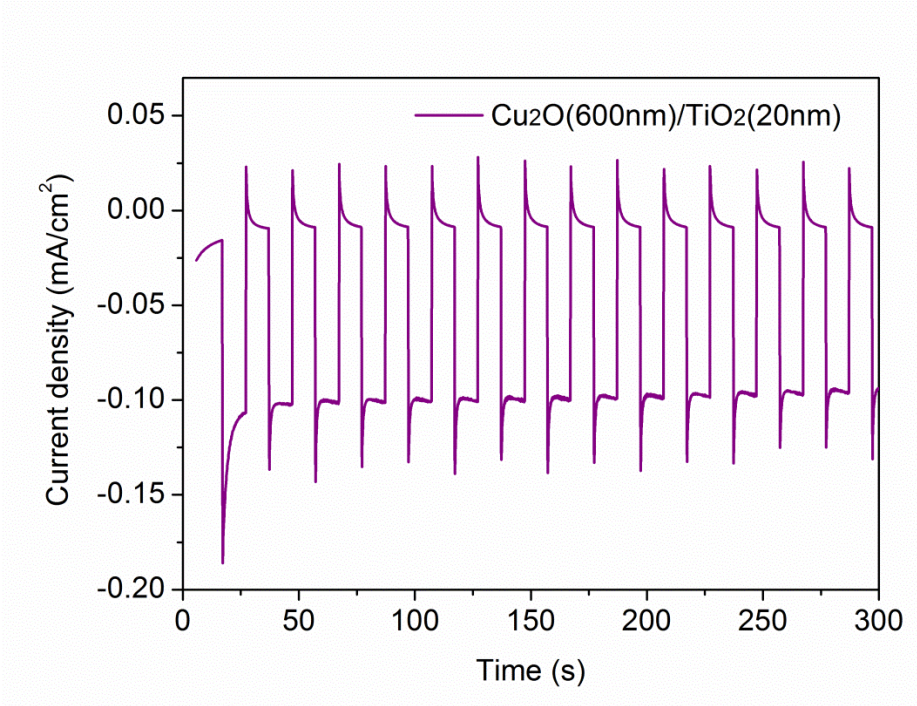
**Fig. S2** Cross section SEM image of copper oxide thin film deposited on Si, showing a smooth film with thickness of about 300 nm.



**Fig. S3** XRD spectra of NiO<sub>x</sub> thin film supported on Si annealed at 200 °C.



**Fig. S4** Photocurrent stability of  $\text{Cu}_2\text{O}$  and  $\text{CuO}$  photocathodes incorporated with  $\text{NiO}_x$  co-catalyst.



**Fig. S5** Photocurrent stability of  $\text{Cu}_2\text{O}$  photocathode encapsulated with a 20 nm thick  $\text{TiO}_2$  layer that was deposited by atomic layer deposition (ALD).