

Supporting Information

Photocatalytic Carbon Dioxide Reduction by Copper Oxide Nanocluster-Grafted Niobate Nanosheets

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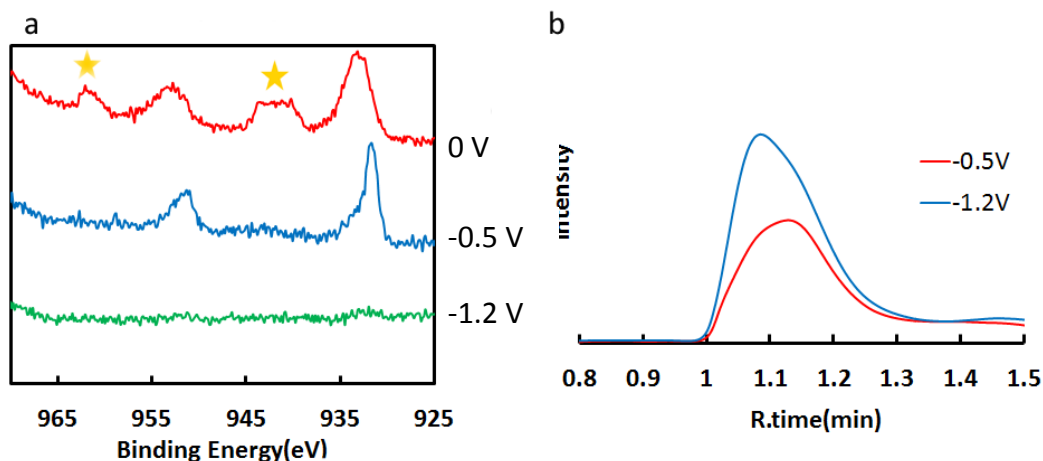


Figure S1. (a) XPS spectra of Cu in copper oxide nanoclusters grafted Ti metal electrode after applied the bias-potential of 0 V, -0.5 V and -1.2 V (vs. Ag/AgCl) respectively. Shape-up satellites of Cu(II) are marked with yellow stars. The intensity was the integrated value. Measurement condition: 10 cycles, 3 repeats, one step = 0.15 eV, 40 ms. (b) the gas chromatograph of the headspace gas under bias-potential of -0.5 V and -1.2 V.

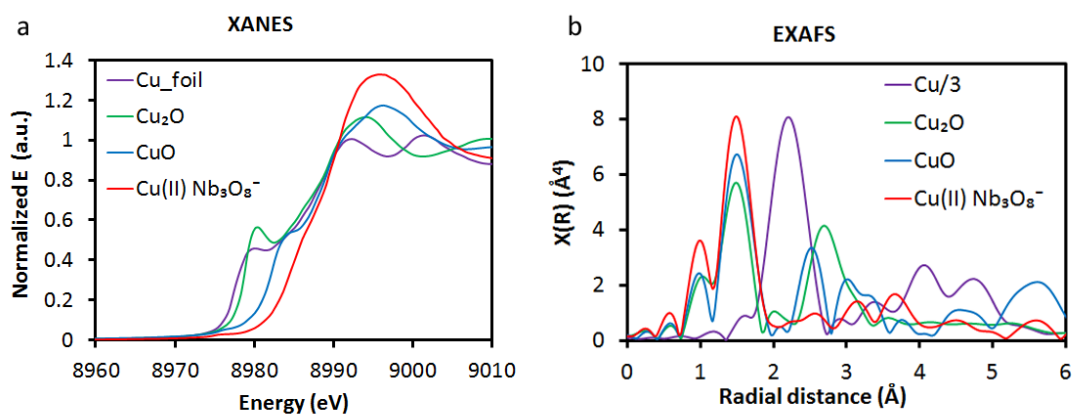


Figure S2. Cu K-edge XANES spectra (a) and EXAFS (b) of 0.5%wt copper oxide nanoclusters-grafted Nb_3O_8^- nanosheets. For comparison, the spectra of Cu metal, Cu_2O and CuO were also included.

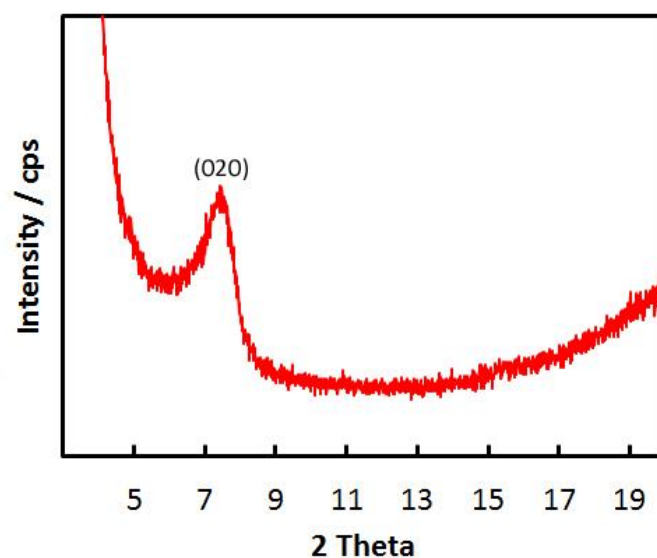


Figure S3. The X-ray diffraction pattern of the Nb_3O_8^- nanosheets thin film.

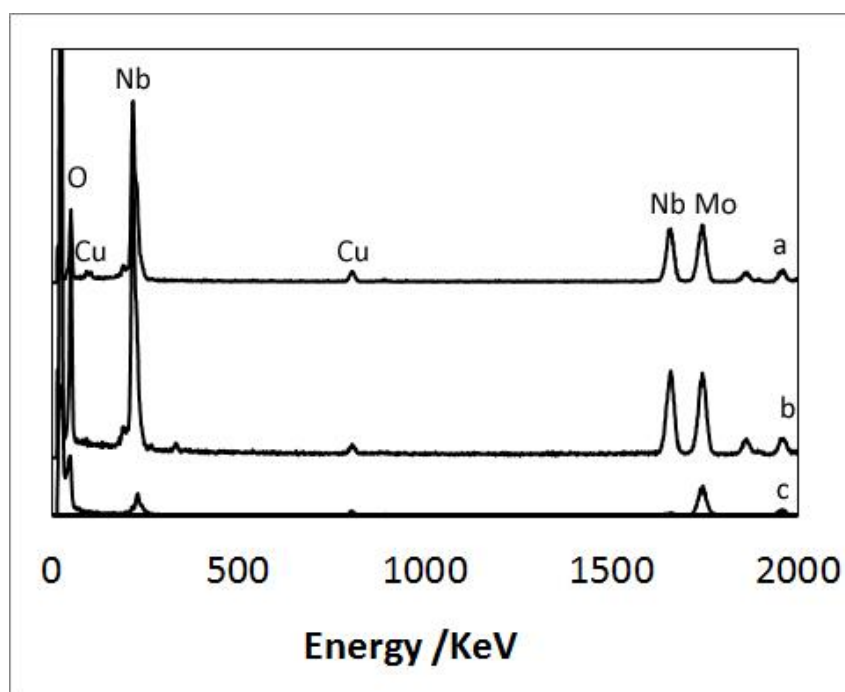


Figure S4. The energy dispersive X-ray spectroscopy (EDS) of 2.5%wt copper oxide nanoclusters-grafted Nb_3O_8^- nanosheets (a). For comparison, the spectroscopy of bare Nb_3O_8^- nanosheets (b) and bare sample stage (c).

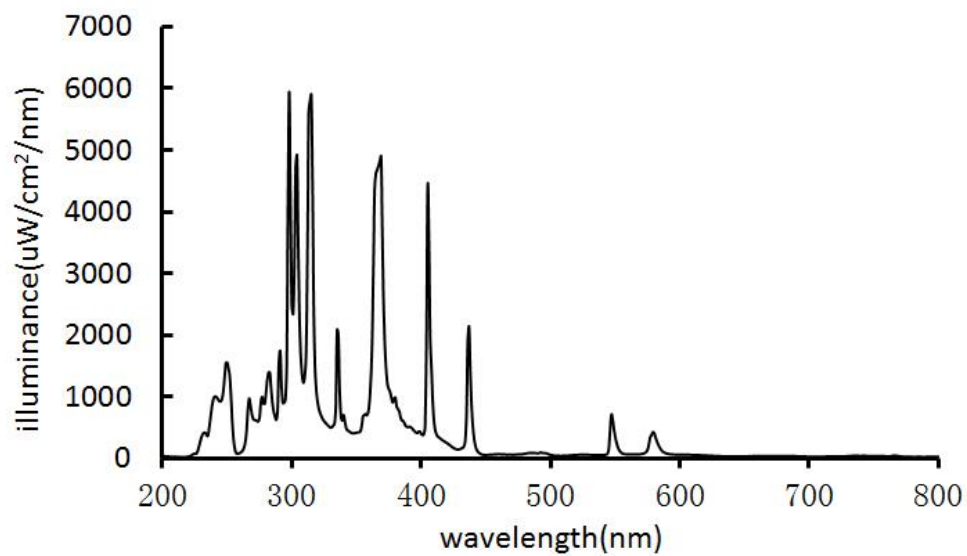


Figure S5. The spectrum of the Xe-Hg UV light lamp.

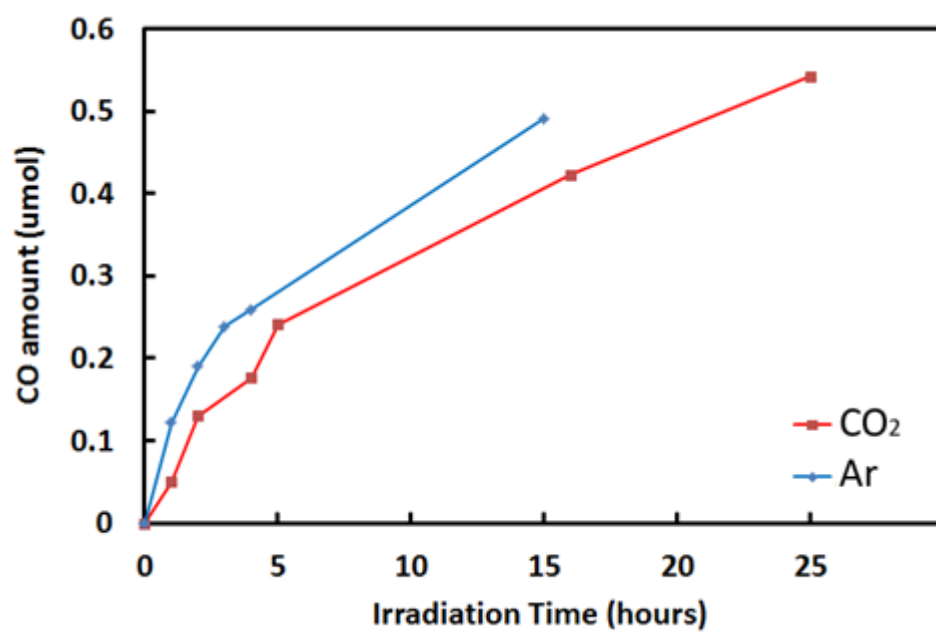


Figure S6. Photocatalytic CO₂ reduction evaluation of Nb₃O₈⁻ nanosheets powders without any co-catalysts grafted.

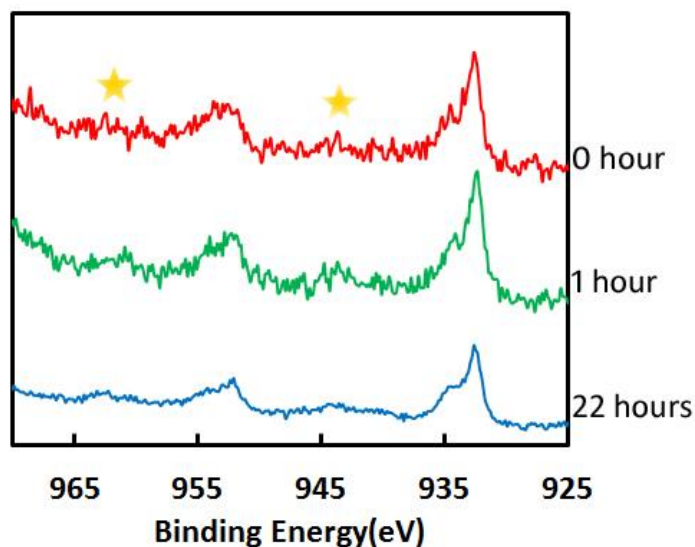


Figure S7. XPS spectra of Cu in the 10 wt% copper oxide nanoclusters-grafted niobate nanosheets after the UV irradiation of 0 hour, 1 hour and 22 hours. Shape-up satellites of Cu(II) are marked with yellow stars. The intensity was the integrated value. Measurement condition: 10 cycles, 3 repeats, one step = 0.15 eV, 40 ms.

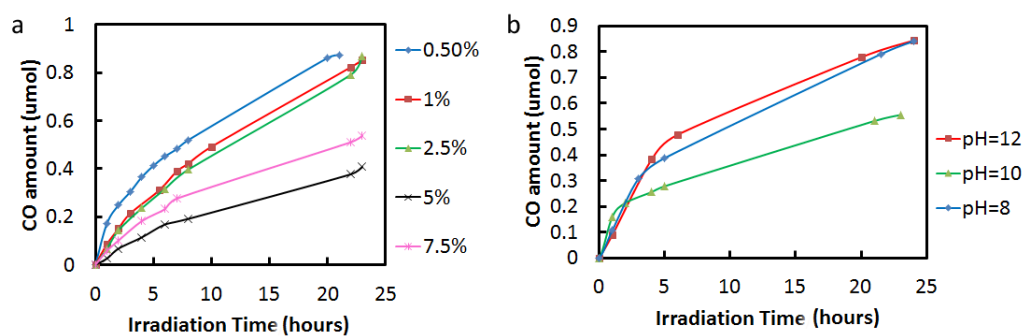


Figure S8. (a) The produced CO amount on terms of copper oxide nanoclusters loading amount. Each group used 900 mg photocatalysts respectively. (b) The produced CO amount on terms of electrolyte pH for 0.5%wt copper oxide nanoclusters grafted niobate nanosheets.

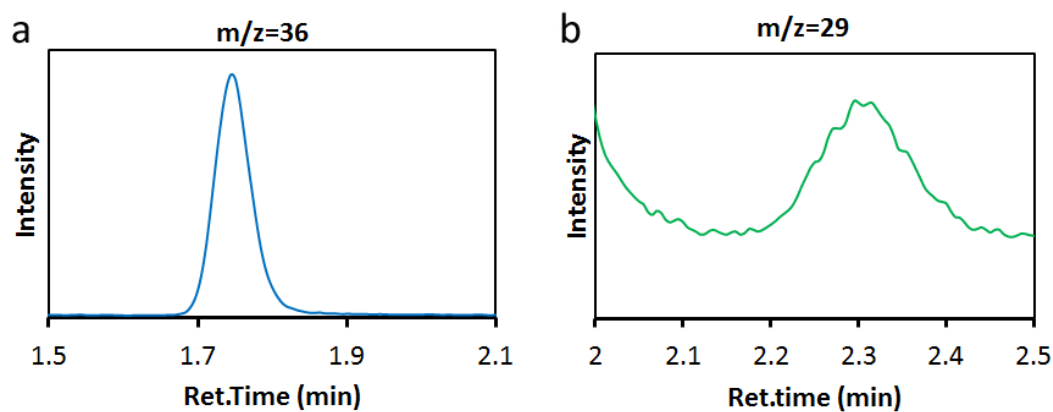


Figure S9. (a) The mass chromatography spectra of $^{18}\text{O}_2$ ($m/z=36$) generated from UV-irradiated Nb_3O_8 nanosheets grafted with 0.5 wt% copper oxide nanoclusters in 0.5 M $\text{KHCO}_3/\text{H}_2^{18}\text{O}$ solution purged with $^{12}\text{CO}_2$; (b) the peak of ^{13}CO ($m/z=29$) generated from UV-irradiated copper oxide nanocluster-grafted Nb_3O_8 nanosheets in 0.01 M $\text{NaOH}/\text{H}_2^{16}\text{O}$ solution purged with $^{13}\text{CO}_2$.