Supporting Information

for

WO_{3-x} Sensitized TiO_2 Sphere with Full-spectrum-driven Photocatalytic Activities from UV to Near infrared

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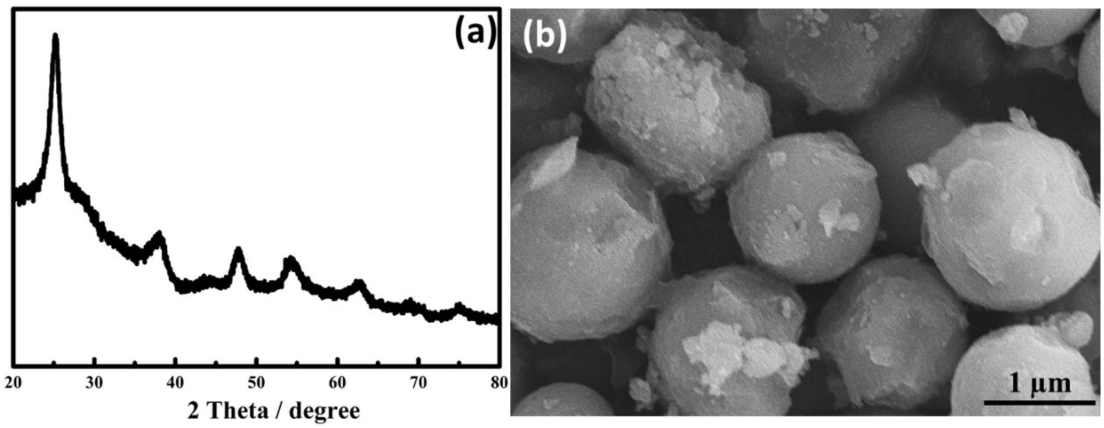

Figure S1 (a) XRD pattern and (b) SEM image of W/Ti 6% sample after 5 photocatalytic recycles.

Calculation of reaction rate constant and Relative photonic efficiency

Table S1 The reaction rate constant of photocatalysts under different part of irradiations.

	TiO_2	W/Ti3%	W/Ti6%	W/Ti15%	W/Ti30%	$W_{18}O_{49}$
$k_{UV}(min^{-1})$	0.064	0.044	0.90	0.0098	0.011	0.016
$k_{Visible}(min^{-1})$	0.012	0.011	0.017	0.0033	0.0018	0.0048
$k_{NIR}(min^{-1}\cdot(mol/L^{-1})^{-1})$	6.4 x 10^{-4}	7.9 x 10^{-4}	7.0 x 10^{-2}	2.5 x 10^{-3}	3.0 x 10^{-3}	2.3 x 10^{-3}

A transformed method to determine the photonic efficiency was used to compare the intrinsic activity of samples in this work. According to the definition in previous work (J. Phys. Chem. Lett., 2015, 6, 1907-1910), the photonic efficiency could be expressed as follow:

Photonic efficiency (λ) = reaction rate/$I_a(\lambda)$

where $I_a(\lambda)$ is absorbed light intensity. This equation is applicable and simple for monochromatic light induced photocatalytic reaction. Obviously, this work is not in this case. However, as the initial concentration of MB reactant and photosource are same for every test, the above equation could also be given as follow:

Relative photonic efficiency = rate constant/A·P

Above A is optical absorbance of reaction system, while P is light power density. For the UV or NIR driven photocatalytic reaction, A is equal to the absorbance of photocatalyst as MB has no absorption in these two regions. As to visible light irradiation, A is a sum of photoabsorption from photocatalyst and MB solution. In this work, the power densities from photosource are 185, 166 and 42.7 mW/cm^2 for UV, visible and NIR irradiations, respectively. Although this method can't give an exact percentage of photonic efficiency, but it is sufficient to compare the relative activity for samples in this work. By this way, it also revealed that W/Ti6% sample was of highest relative photonic efficiency.

Table S2 Relative photonic efficiency (PE) of photocatalysts under different types of irradiations.

	TiO_2	W/Ti3%	W/Ti6%	W/Ti15%	W/Ti30%	$W_{18}O_{49}$
$PE_{UV}(min^{-1}W^{-1})$	0.8	0.16	3.42	0.037	0.043	0.062
$PE_{Visible}(min^{-1}W^{-1})$	0.014	0.012	0.016	0.0036	0.002	0.0041
$PE_{NIR}(min^{-1}W^{-1})$	0.15	0.092	2.73	0.12	0.11	3×10^{-3}
$(mol/L^{-1})^{-1})$						

Photocurrent response test

In this work, photoelectrochemical measurements were obtained on a 660 series potentiostat (CH Instruments, Austin, TX). A photoelectrochemical cell was designed with the W/Ti 6% sample coated ITO glass as the working electrode, a platinum wire as counter electrode, a Ag/AgCl electrode as the reference electrode, and 0.5 M $LiClO_4$ aqueous solution as the electrolyte.

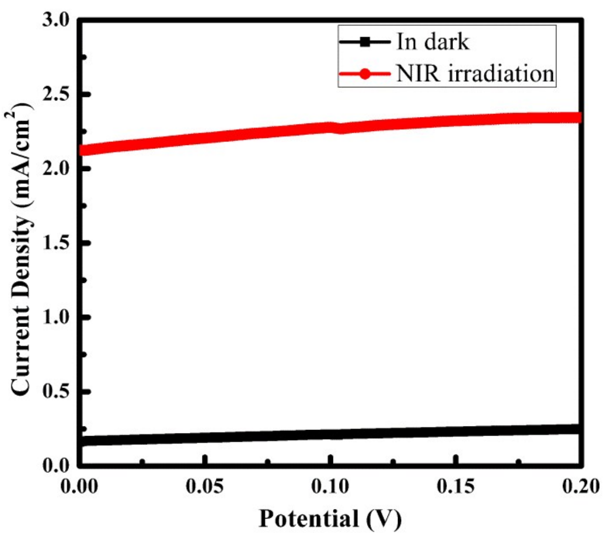

Figure S2 Current density versus potential curve of W/Ti 6% sample.