Supplementary Information

Photocatalytic H_2O_2 Production Over Photocatalysts Prepared By Phosphine-protected Au_{101} Nanoclusters on WO_3

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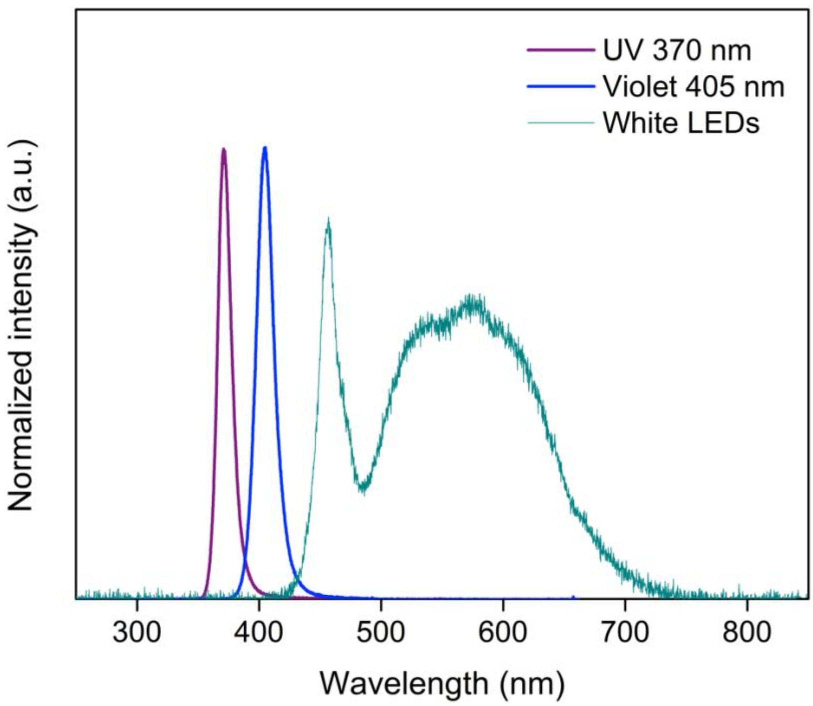

Fig. S1. Emission profile of 370 nm and 405 nm LED lamps used in this work

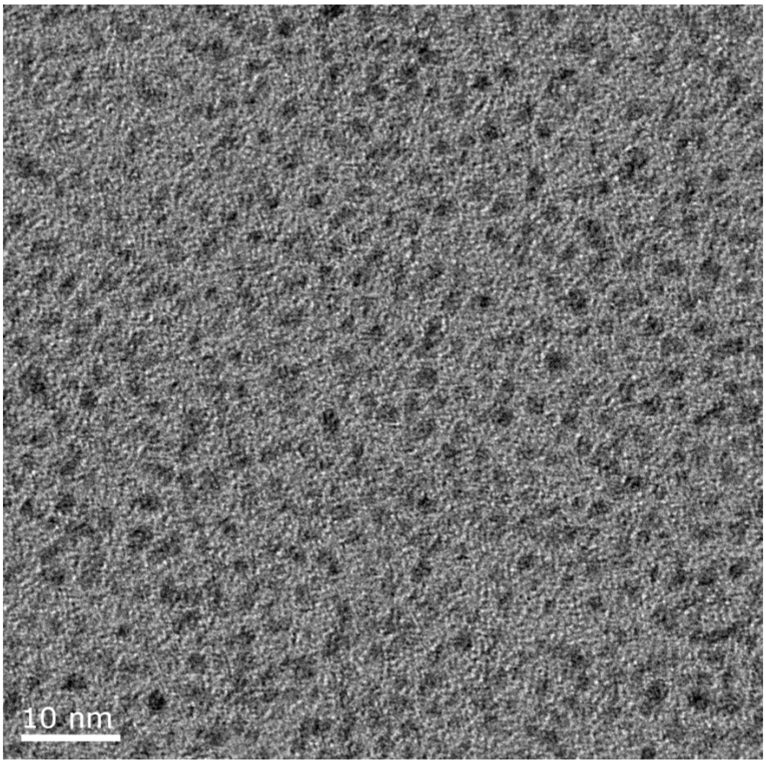

Fig. S2. HRTEM image of pristine Au_{101} clusters dissolved in DCM.

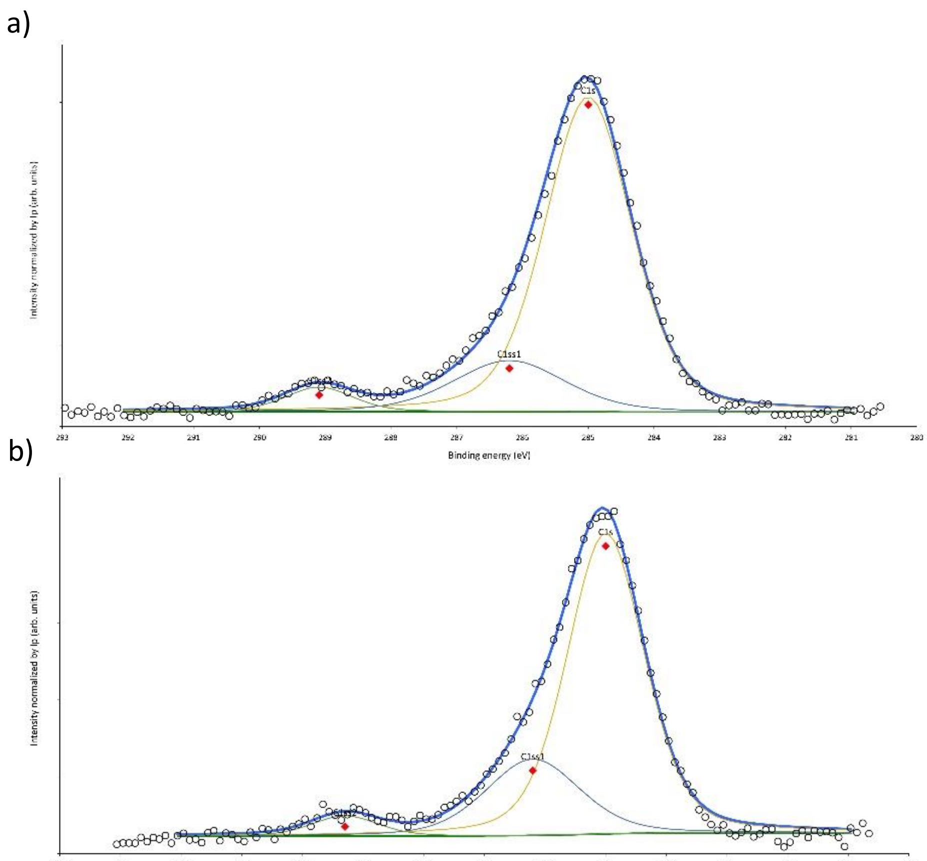

Fig. S3. C1s spectra of a) uncalcined, and b) calcined Au_{101}/WO_3 photocatalysts.

Table S1. Peak element and percentage composition of WO_3-based photocatalysts

	Element	Peak position (± 0.2eV)	WO_3	Au_{101}/WO_3	Au_{101}/WO_3 calcined
Before photocatalytic reaction	C 1s	P1 – (285)	13.9	20.2	14.3
		P2 – (286.2)	5.5	5.4	6.0
		P3 – (289.2)	1.1	1.3	0.9
	O 1s	P1 – (530.5)	52.5	49.5	56.3
		P2 – (531.5)	11.0	7.2	7.3
	Au $4f_{7/2}$	P1 – (84.2)	-	0.36	0.24
	P $2p_{3/2}$	P1 – 131.8 (Au-PPh_3)	-	0.22	-
		P2 – 132.7 (O= PPh_3)	-	-	0.14
	W $4f_{7/2}$	P1 (35.7–35.9)	16.0	14.9	14.9
			Au_{101}/WO_3 1h	Au_{101}/WO_3 calc. 1h	Au_{101}/WO_3 calc. 3h
After photocatalytic reaction	C 1s	P1 – (285)	9.7	14.1	10.2
		P2 – (286.2)	14.4	6.3	6.9
		P3 – (289.2)	1.4	1.2	1.4
	O 1s	P1 – (530.5)	47.0	51.5	56.6
		P2 – (531.5)	13.9	11.8	10.1
	Au $4f_{7/2}$	P1 – (84.2)	0.26	0.17	0.16
	P $2p_{3/2}$	P1 – 131.8 (PPh_3)	0	0	0
		P2 – 132.7 (O= PPh_3)	0	0	0
	W $4f_{7/2}$	P1 (35.7–35.9)	13.4	15.0	14.6

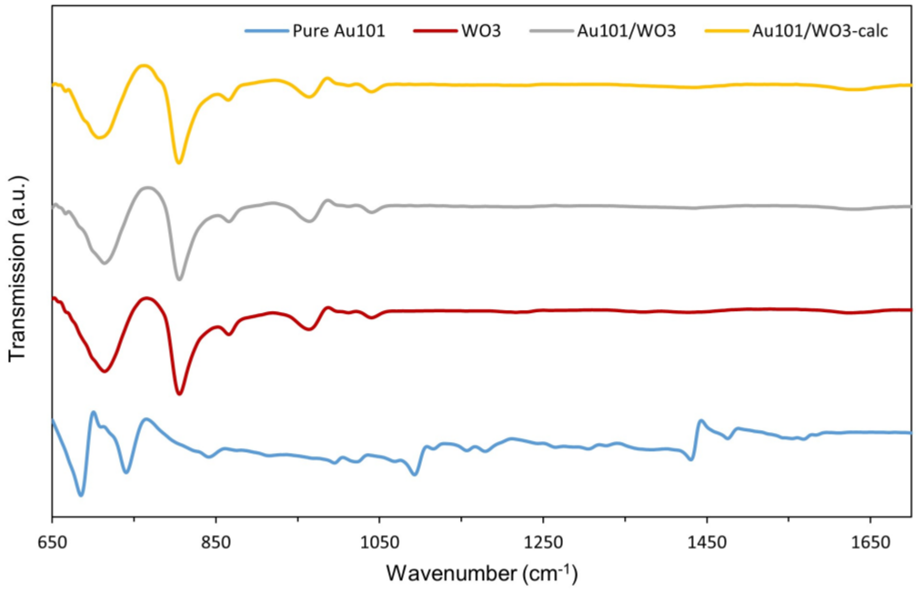

Fig. S4. FTIR spectra of pure Au_{101} clusters, WO_3, uncalcined and calcined Au_{101}/WO_3.

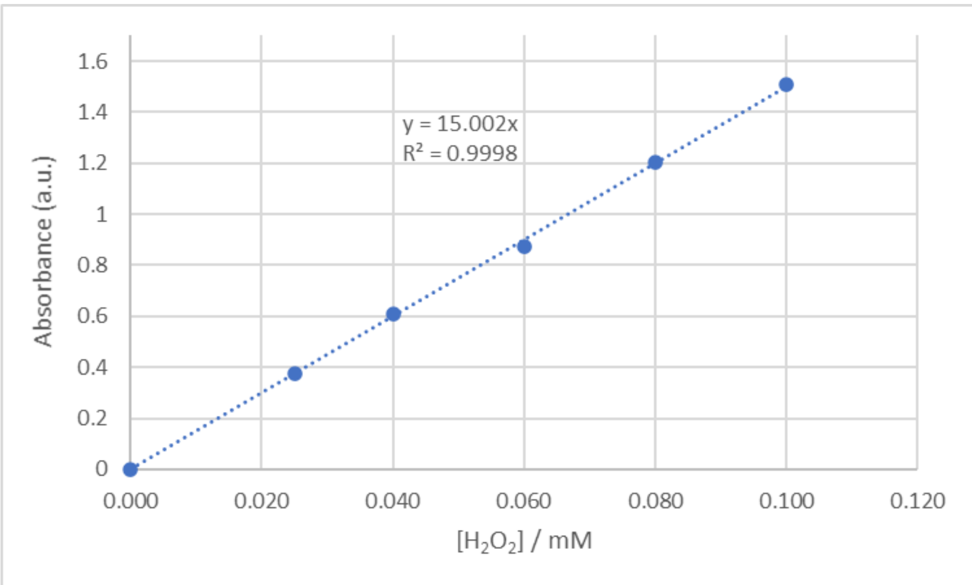

Fig. S5. Calibration curve of standard H_2O_2 solutions monitored at 454 nm by UV-vis spectroscopy.

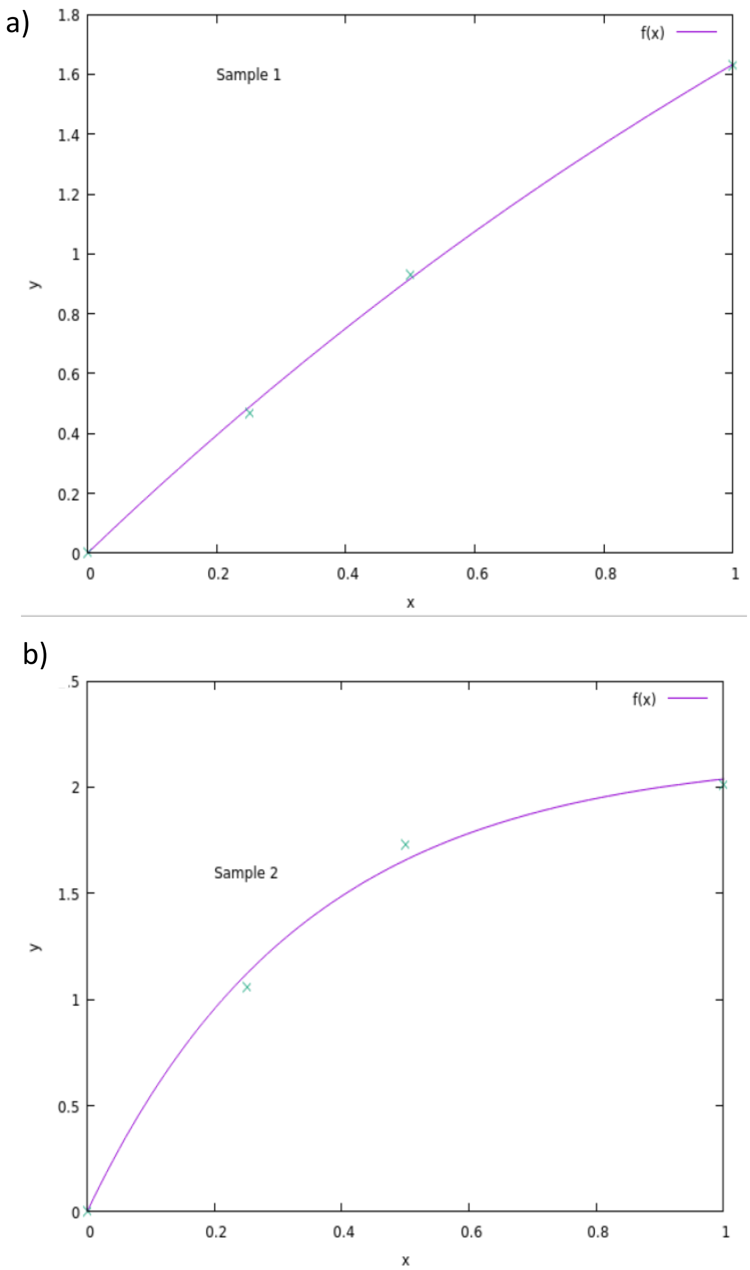

Fig. S6. Curve fitting using GNU Plot software for a) Sample 1 (Au_{101}/WO_3), and b) Sample 2 (Au_{101}/WO_3-calcined)

Table S2. Comparison of photocatalytic activity in H_2O_2 production of Au-based photocatalysts

Photocatalyst	Light source	Reaction mixture	$[H_2O_2]$ (mM)	Time (h)	Ref.
0.25% Au_{101}/WO_3 calcined	365 nm	4% $EtOH/H_2O$	2.05	1	This work
		water	0.31	0.5	
0.25% Au/TiO_2	>300 nm	4% $EtOH/H_2O$	~7	24	1
0.88% Au/TiO_{2}-CO_3^{2-}	>430 nm	4% $HCOOH/H_2O$	1 mM	1	2
0.61% Au/TiO_2	>320 nm	4% $MeOH/H_2O$, pH 9	1.31	10	3
0.34% Au/WO_3	>420 nm	4% $MeOH/H_2O$	0.54	5	4
		water	0.18	5	

References

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