Electronic Supporting Information

Direct Photocatalytic Hydrogen Evolution from Water Splitting Using Nanostructures of Hydrate Organic Small Molecule as Photocatalysts

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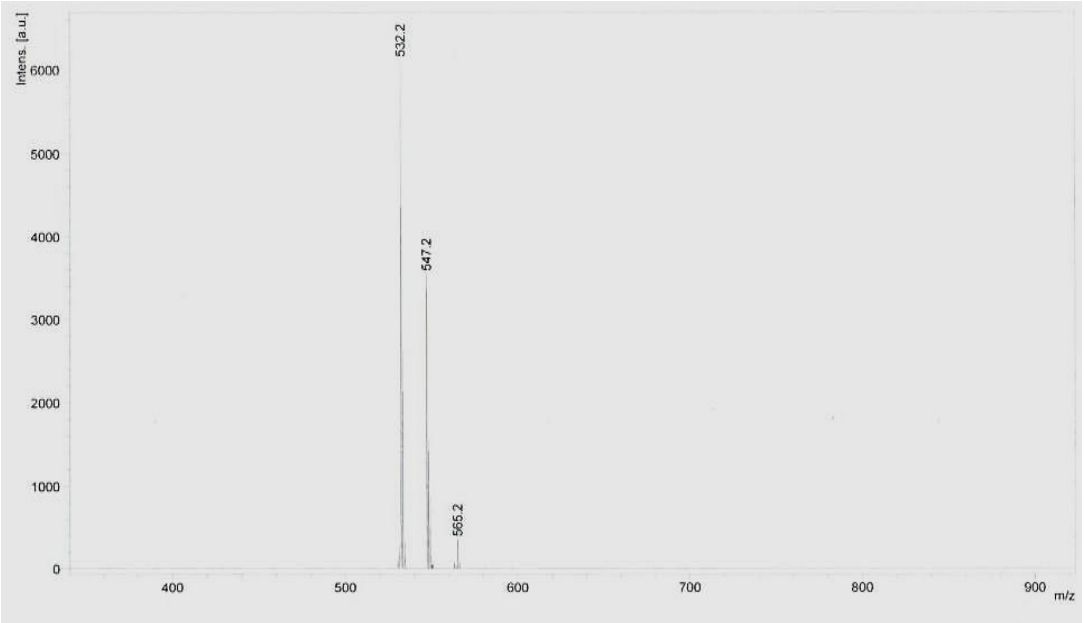

Fig. S1 MALDI-TOF Mass spectra of rubrene nanoparticles. Calculation for $C_{42}H_{28}$ (M^+), m/z, 531.7 ; found, 532.2. The peaks at 547.2 should be $C_{42}H_{27}O$, which results from the oxidation of rubrene in air.[1]

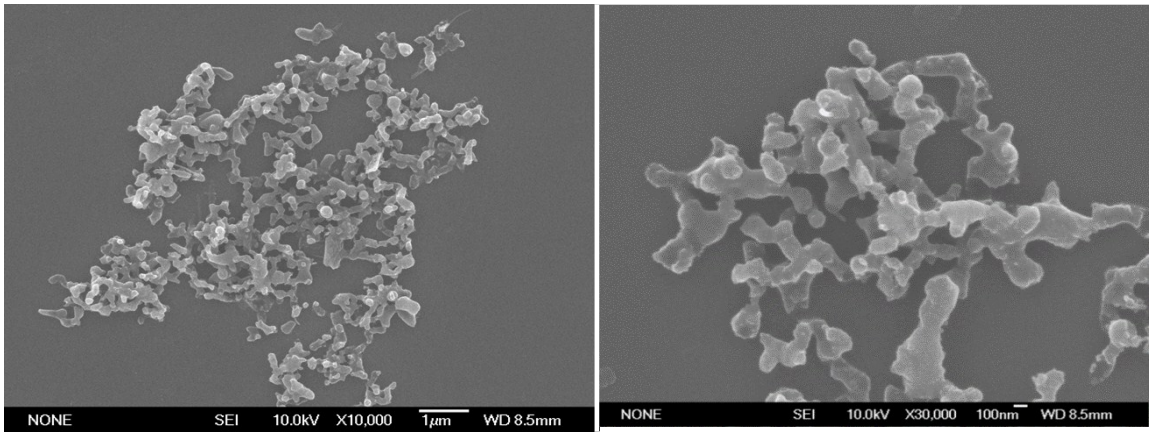

Fig. S2 SEM images of rubrene nanoparticles with the average size of ~200 nm obtained after 1 mL of 1 mM rubrene perchlorate was rapidly injected into 3 mL of ultrapure water.

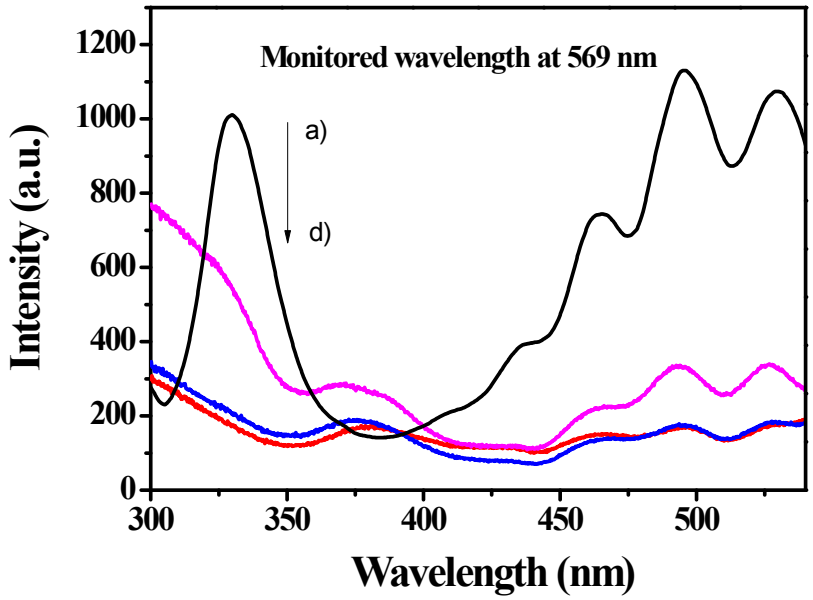

Fig. S3 The excitation spectra in aqueous dispersion system monitored at 569 nm. a) rubrene nanoparticles and the nanostructure of Rubrene/ZnP-NS with different molar ratio of b) 2:3, c) 1:3 and d) 1:6.

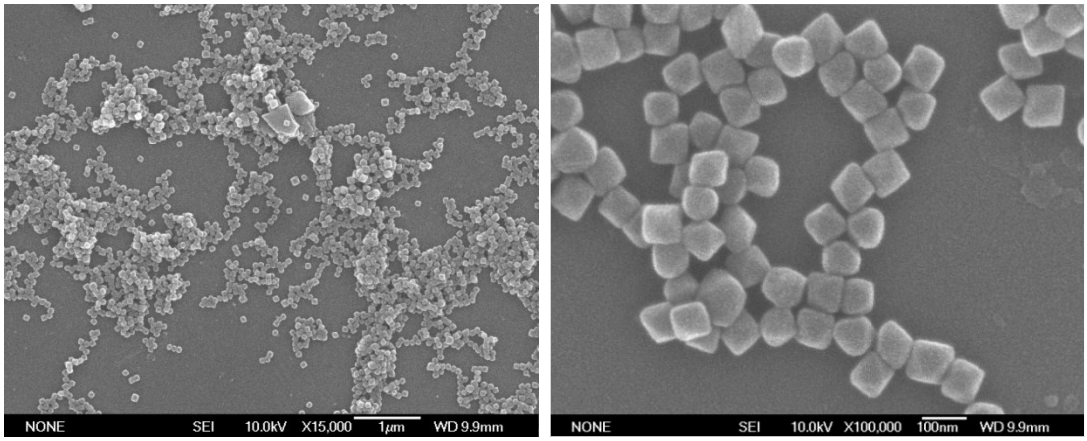

Fig. S4 SEM images of ZnP octahedron nanoparticles(ZnP-NPs) with the average size of ~80 nm obtained after 1 mL of 1 mM ZnP perchlorate was rapidly injected into 3 mL of ultrapure water including 6 mM CTAB and aged for one hour.

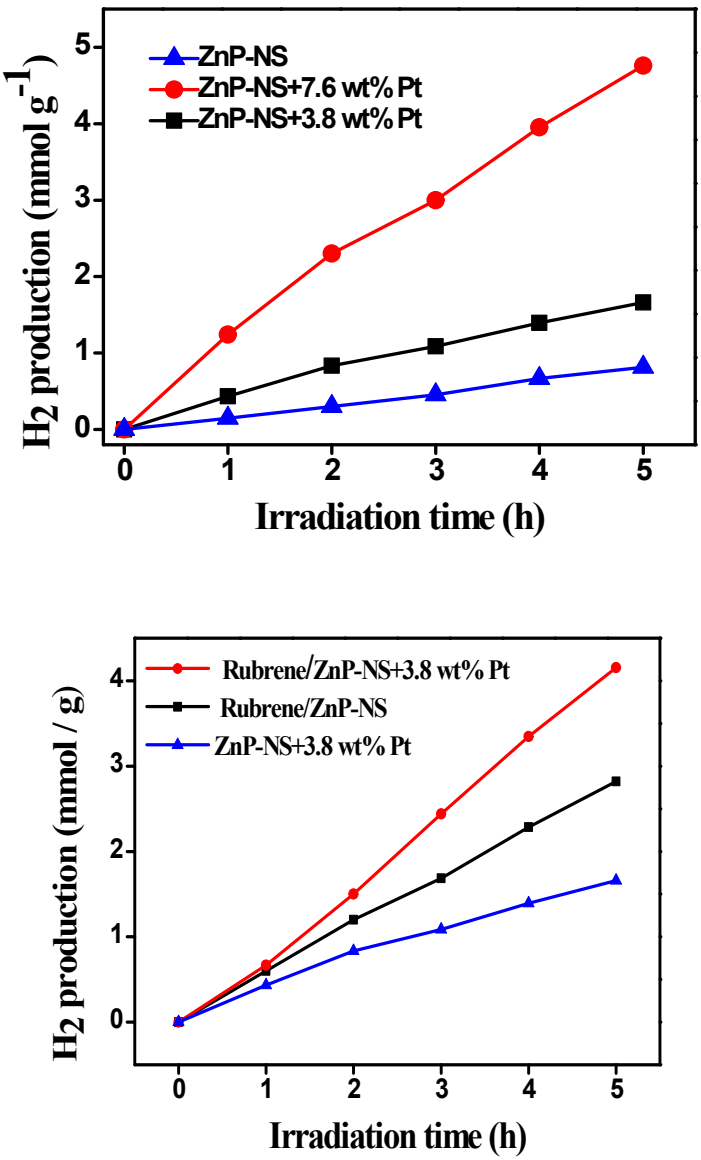

Fig. S5 Time course of photocatalytic hydrogen evolution of ZnP-NS and Rubrene/ ZnP-NS (1:3) nanostructure with and without Platinum (Pt).

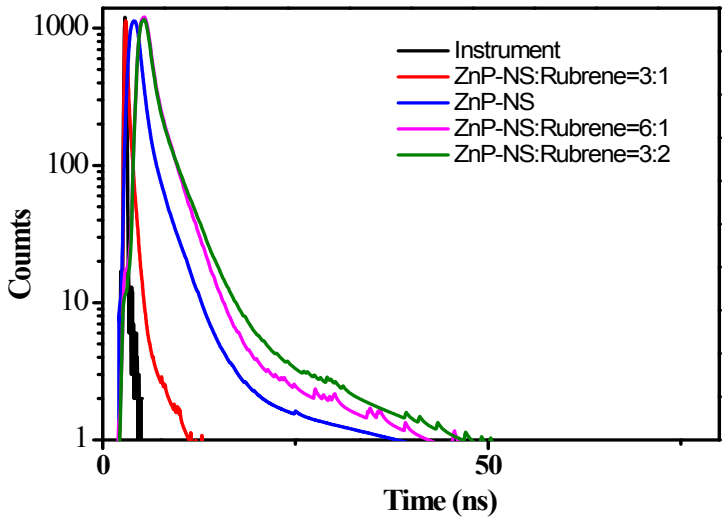

Fig. S6 Fluorescence decay profiles of sole ZnP-NS and ZnP-NS in Rubrene /ZnP-NS composite with molar ratio of 2:3, 1:3 and 1:6. The system was monitored at 643 nm upon the excitation wavelength of 350 nm.

Table S1. Fluorescence decay times of the fluorescence of sole ZnP-NS and ZnP in Rubrene/ZnP-NS composite with molar of 2:3, 1:3 and 1:6. The system was monitored at 643 nm upon the excitation wavelength of 350 nm.

Molar ratio of ZnP/rubrene	τ_1		τ_2		τ_3		τ^a/ns
	ns	$\%_1$	ns	$\%_2$	ns	$\%_3$	
1 : 0	0.61	69.4	2.52	25.2	45.83	5.3	3.49
6 : 1	0.48	44.8	2.16	51.6	20.93	3.7	2.10
3 : 1	0.41	46.1	1.93	49.1	14.91	4.8	1.85
3 : 2	0.59	50.2	2.67	44.2	19.43	5.1	2.47

[a] Average fluorescence lifetime, $\tau^a=(\tau_1\%_1+\tau_2\%_2+\tau_3\%_3)/100$

1 C. Kloc , K. J. Tan, M. L. Toh, K. K. Zhang, Y. P. Xu, *Apply. Phys. A-mater.*, 2009, **95**, 219-224.