Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

H-bond-induced luminescence enhancement in Pt_1Ag_{30} nanocluster and its application in methanol detection

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Notes: The authors declare no competing financial interest.

This Supporting Information includes:
Figures S1-S20
Tables S1-S2

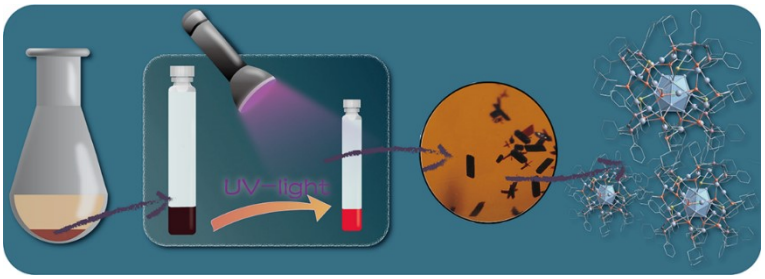

Figure S1. Schematic diagram of the crystallization process of Pt_1Ag_{30}.

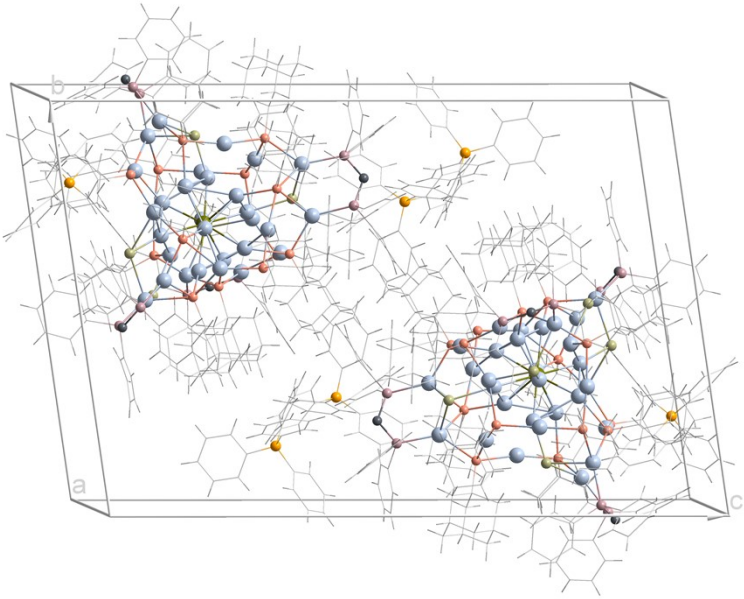

Figure S2. The unit cell of $[Pt_1Ag_{30}(SAdm)_{14}(Bdpm)_4Cl_5](BPh_4)_3$ (Color labels: blue = Ag; dark green = Pt; red = S; purple = P; yellow = B; dark grey = N).

To confirm the optimal excitation wavelength, the excitation spectra for the emission bands at 640 nm and 710 nm were measured, respectively (Figure S3 a). As shown in Figure S3 a, there are two excitation wavelengths located at 525 nm and 440 nm. Then, the 440 nm and 525 nm were employed as excitation wavelengths to measure the emission intensity of Pt_1Ag_{30} dissolved in DCM, respectively. As shown in Figure S3 b, the intensity of photoluminescence is higher with the excitation wavelength at 440 nm than that at 525 nm. So, 440 nm was chosen as the optimal excitation wavelength for the photoluminescence test of the Pt_1Ag_{30} nanocluster in this study.

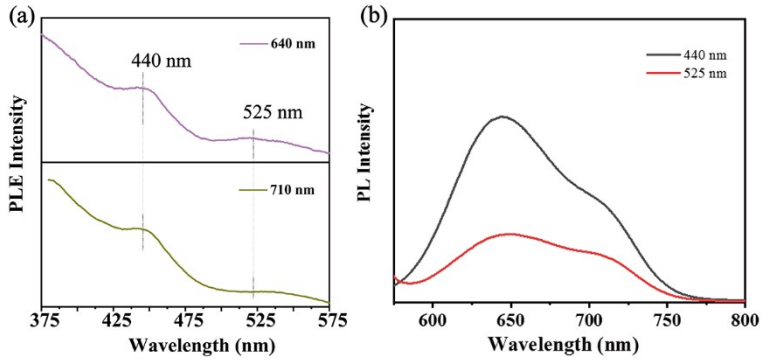

Figure S3. (a) The PL excitation spectra for the emission bands at 640 nm and 710 nm. (b) The PL emission spectra of Pt_1Ag_{30} dissolved in DCM with the excitation wavelength of 440nm and 525 nm, respectively.

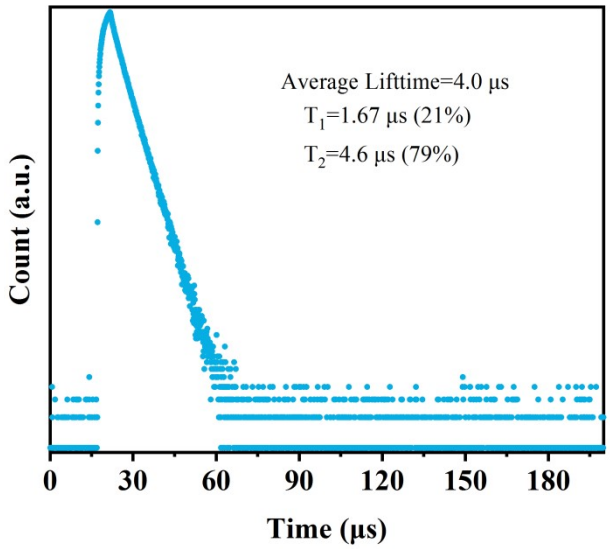

Figure S4. Time-correlated single-photon counting trajectories of Pt_1Ag_{30} in ACN.

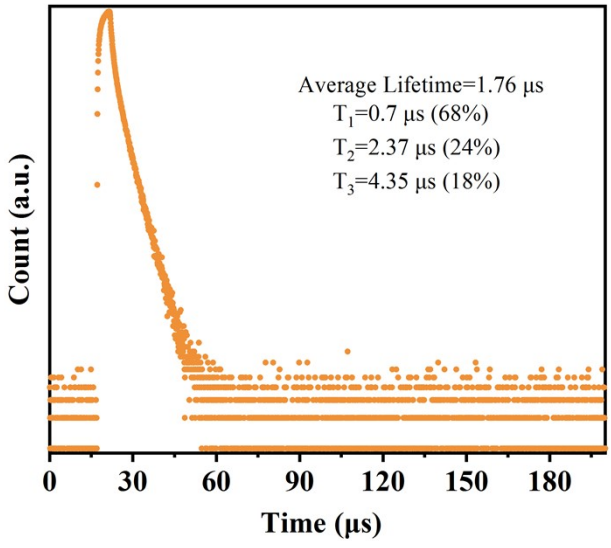

Figure S5. Time-correlated single-photon counting trajectories of Pt_1Ag_{30} DMF.

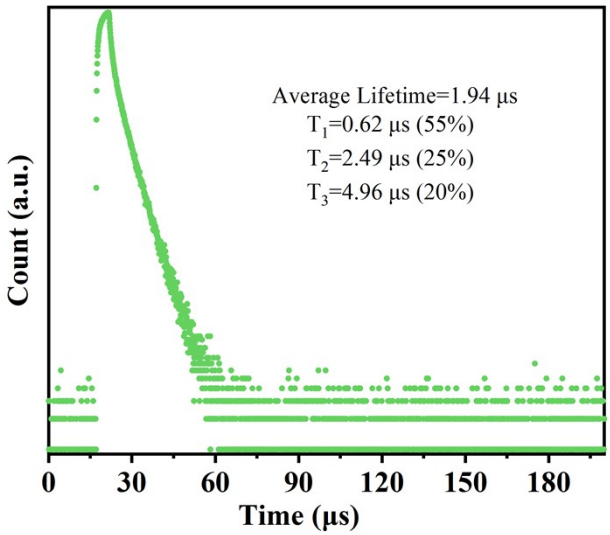

Figure S6. Time-correlated single-photon counting trajectories of Pt_1Ag_{30} in acetone.

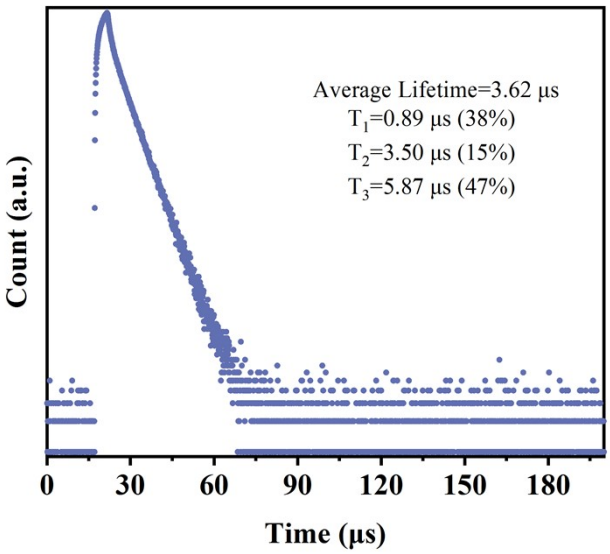

Figure S7. Time-correlated single-photon counting trajectories of Pt_1Ag_{30} in TCM.

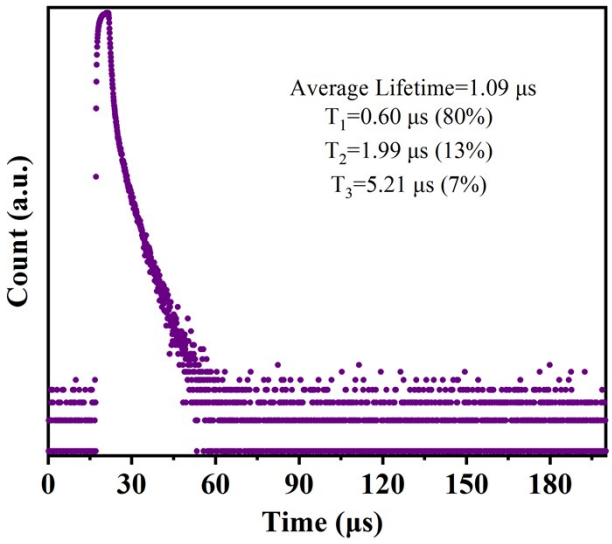

Figure S8. Time-correlated single-photon counting trajectories of Pt_1Ag_{30} in THF.

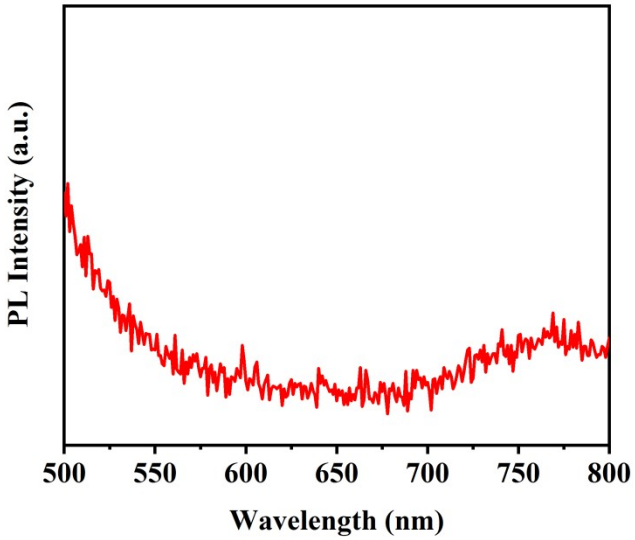

Figure S9. PL spectrum of Pt_1Ag_{30} in a solid state.

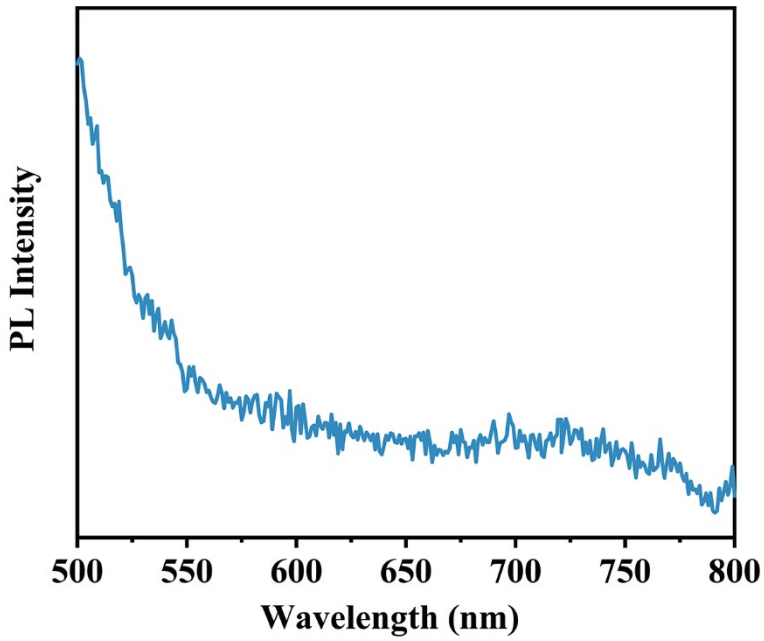

Figure S10. PL spectrum of Pt_1Ag_{30} in single crystal state.

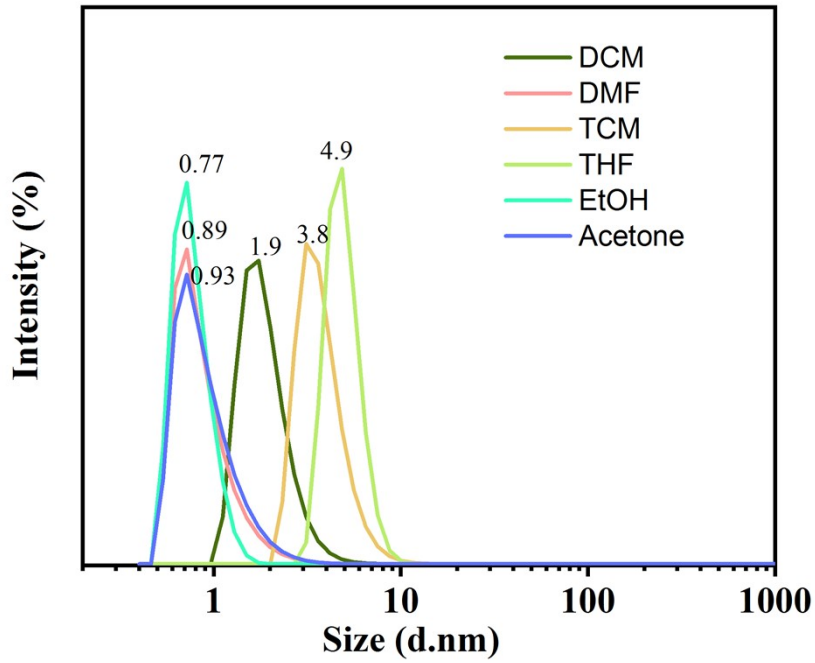

Figure S11. DLS measurement result of Pt_1Ag_{30} dissolved in DCM, DMF, TCM, THF, EtOH, and ACN.

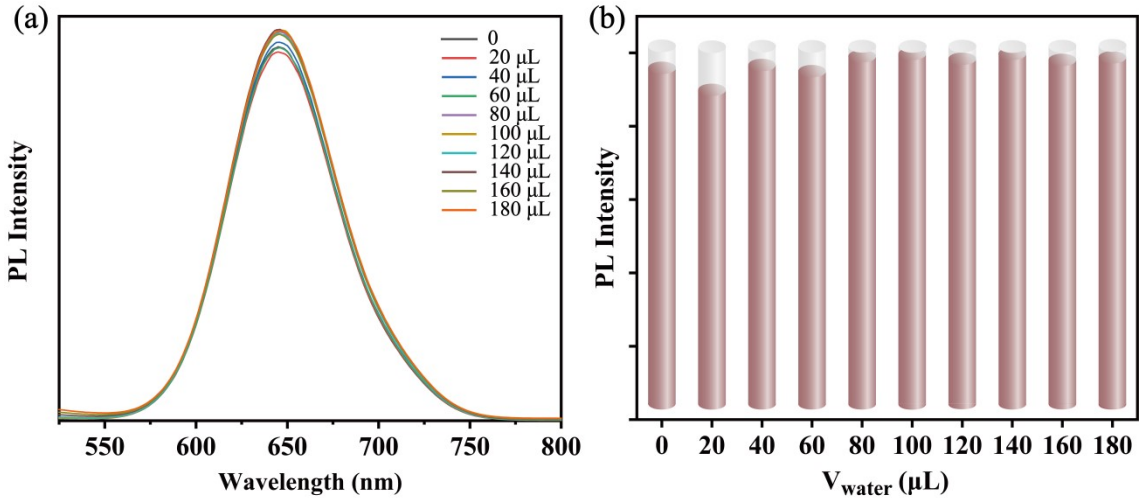

Figure S12. Fluorescence spectra tracing of adding H_2O to MeOH solution of Pt_1Ag_{30}.

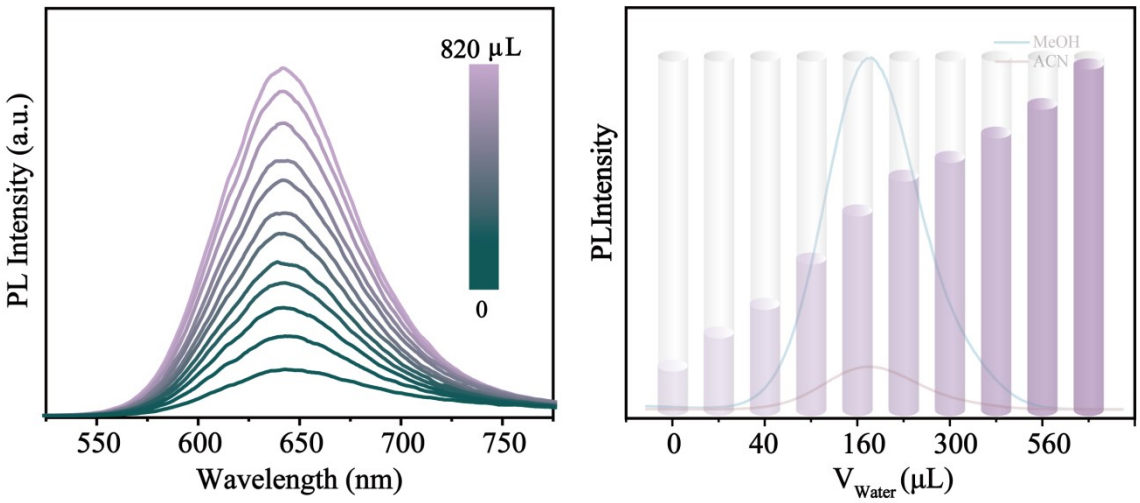

Figure S13. Fluorescence spectra tracing of adding H_2O to ACN solution of Pt_1Ag_{30}.

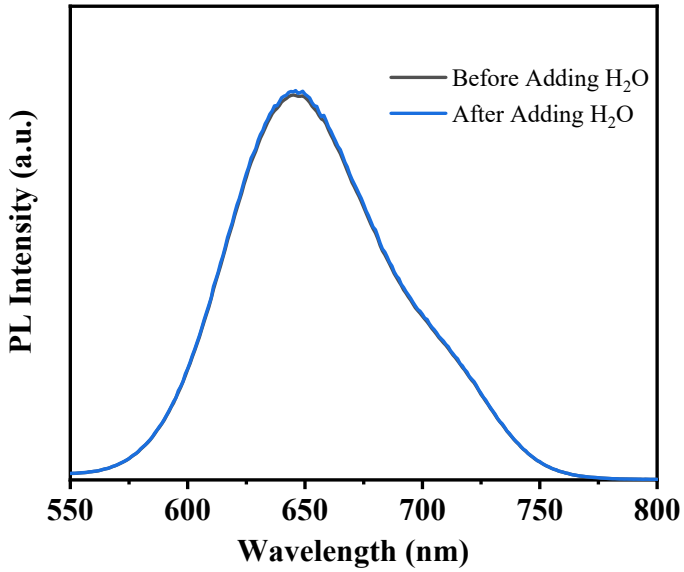

Figure S14. Fluorescence spectra tracing of adding H_2O to DCM solution of Pt_1Ag_{30}.

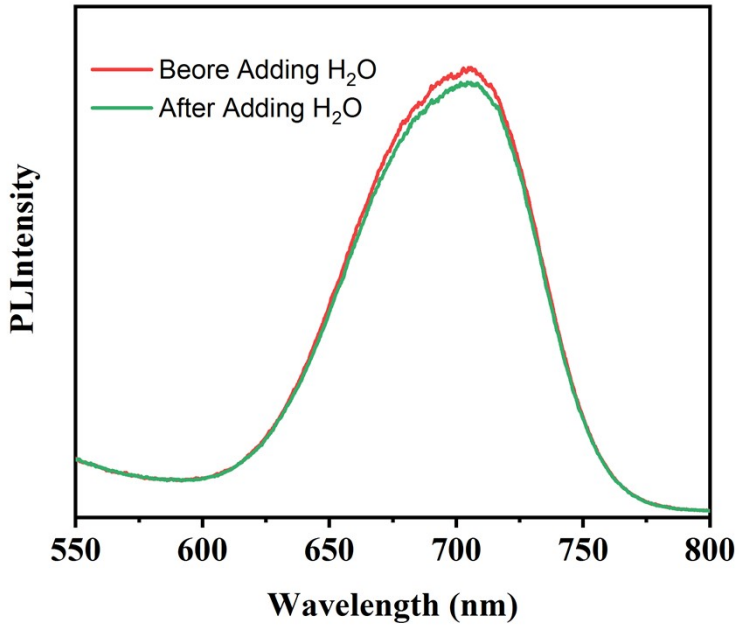

Figure S15. Fluorescence spectra tracing of adding H_2O to TCM solution of Pt_1Ag_{30}.

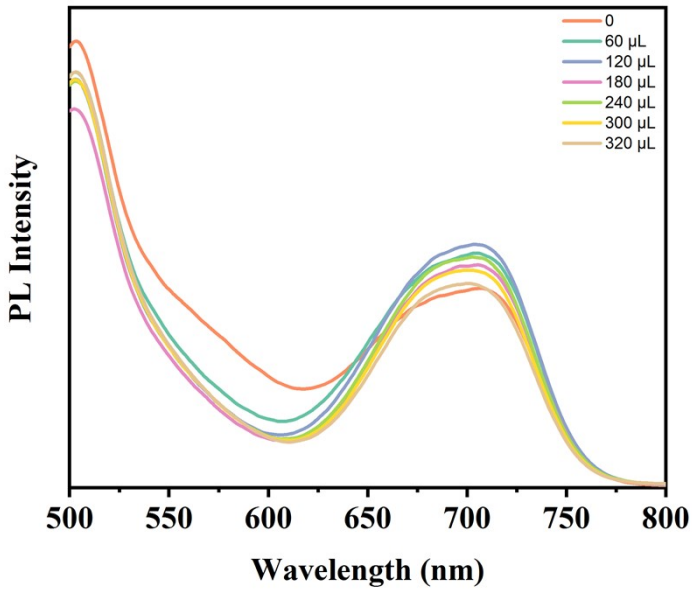

Figure S16. Fluorescence spectra tracing of adding H_2O to THF solution of Pt_1Ag_{30}.

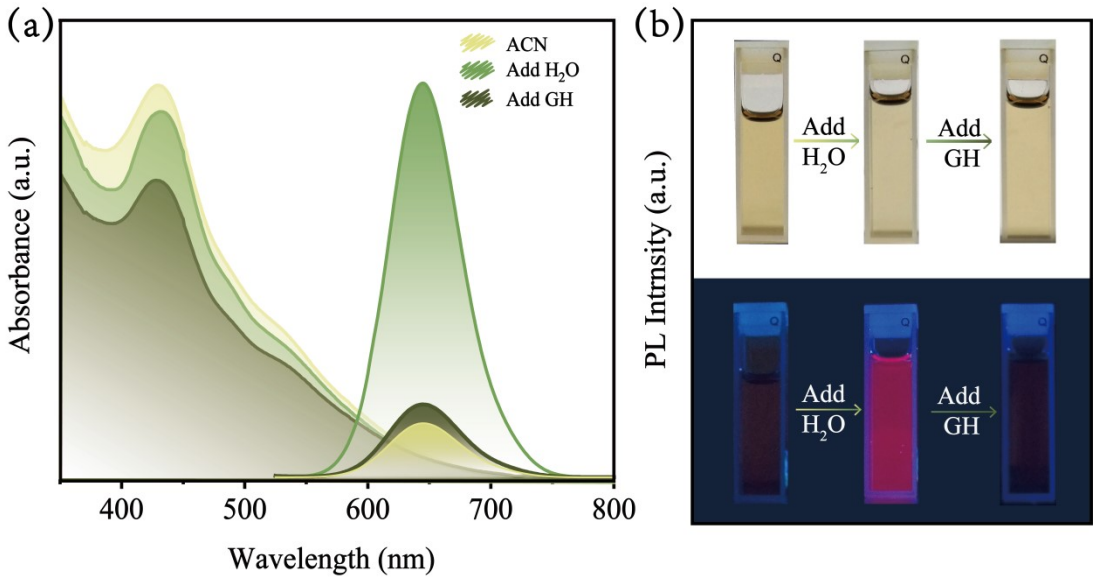

Figure S17. (a) Emissions and UV-Vis spectra of ACN solution of Pt_1Ag_{30} before adding H_2O, after adding H_2O, and after adding GH. (b) Photos of acetone solution under sunlight and UV-lamp in three states.

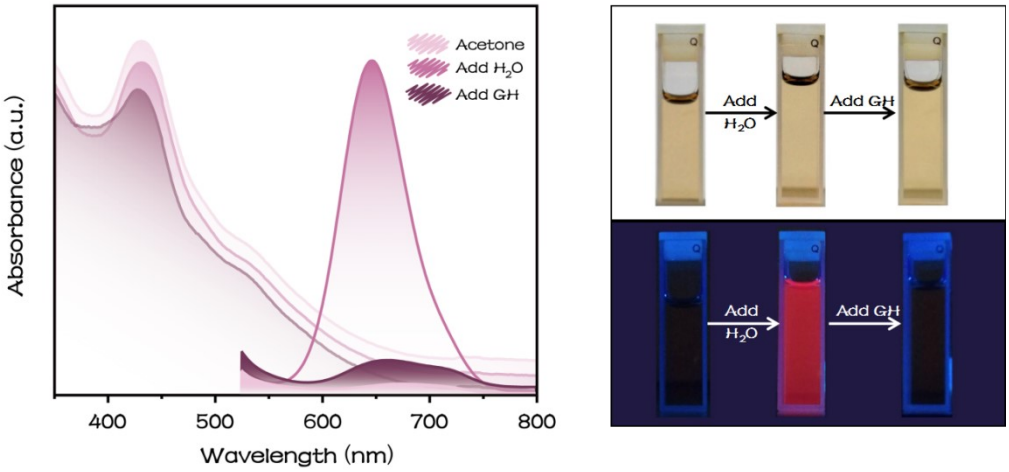

Figure S18. (a) Emissions and UV-Vis spectra of an acetone solution of Pt_1Ag_{30} before adding H_2O, after adding H_2O, and after adding GH. (b) Photos of acetone solution under sunlight and UV-lamp in three states.

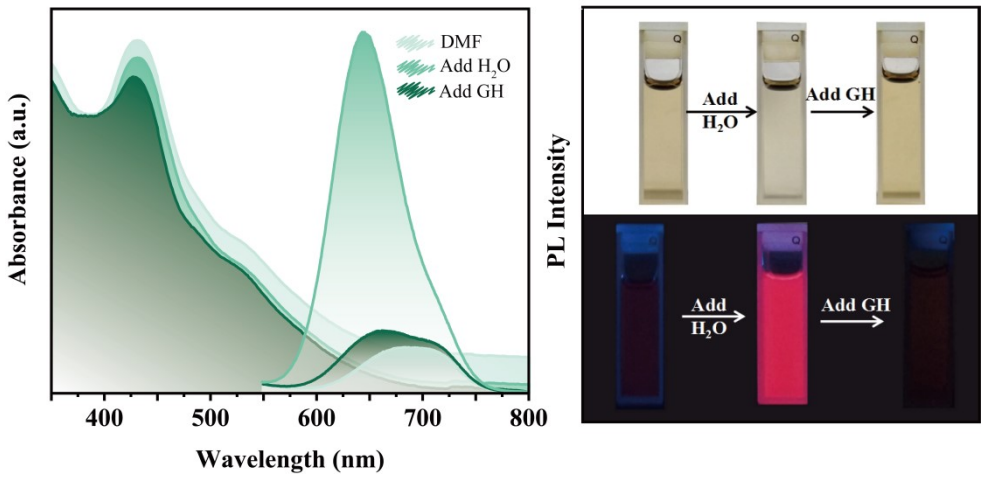

Figure S19. (a) Emissions and UV-Vis spectra of DMF solution of Pt_1Ag_{30} before adding H_2O, after adding H_2O, and after adding GH. (b) Photos of DMF solution under sunlight and UV-lamp in three states.

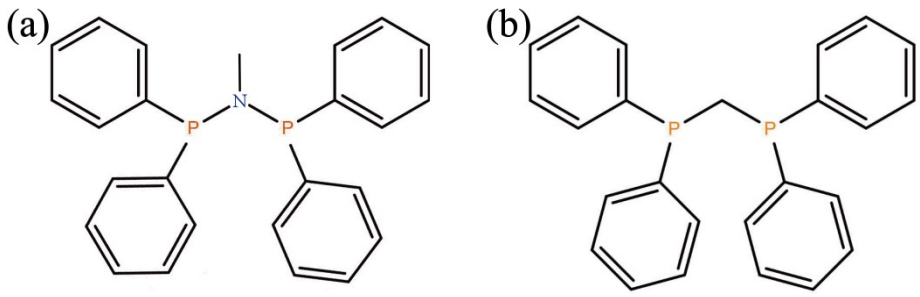

Figure S20. Structure diagram of Bdpm (a) and DPPM (b).

Table S1. Fluorescence quantum yield of Pt_1Ag_{30} in different solvents.

Solvent	QY
MeOH	15.36%
EtOH	2.18%
MeCN	3.08%
DCM	0.79%
TCM	0.31%
Acetone	0.26%
DMF	0.21%
THF	0.13%

Table S2 Crystal data and structure refinement for Pt_1Ag_{30}.

CCDC	2208493
Empirical formula	$C_{333}H_{398}Ag_{30}B_3Cl_{33}N_4P_8PtS_{14}$
Formula weight	9786.97
Temperature/K	150
Crystal system	triclinic
Space group	P-1
a/Å	21.6934(3)
b/Å	23.8539(3)
c/Å	34.4020(5)
α/°	96.7550(10)
β/°	100.9060(10)
γ/°	100.2480(10)
Volume/$Å^3$	16989.5(4)
Z	2
$\rho_{calc}g/cm^3$	1.913
μ/mm^{-1}	18.211
F(000)	8908.0
Crystal size/mm^3	0.35 × 0.3 × 0.1
Radiation	CuKα (λ = 1.54186)
2Θ range for data collection/	9.46 to 133.206
Index ranges	-16 ≤ h ≤ 25, -25 ≤ k ≤ 28, -40 ≤ l ≤ 40
Reflections collected	124446
Independent reflections	56983 [R_{int} = 0.0403, R_{sigma} = 0.0469]
Data/restraints/parameters	56983/1965/3521
Goodness-of-fit on F^2	1.025
Final R indexes [I>=2σ (I)]	R_1 = 0.0613, wR_2 = 0.1672
Final R indexes [all data]	R_1 = 0.0777, wR_2 = 0.1779
Largest diff. peak/hole / e $Å^{-3}$	3.20/-1.42