

Electronic Supplementary Information

Synthesis and Properties Enhancement of Metal Nanoclusters

Templated on Biological Molecule/Ionic Liquids complex

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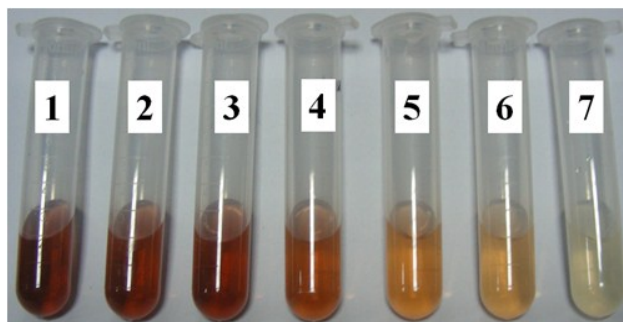


Figure S1. The photographs of AgNCs@GSH/[C₄min] NPs under visible light, which the concentration of [C₄min][BF₄] increased by degrees (the volume ratio of water: [C₄min][BF₄] from 1 to 7 is 9:1, 7:1, 5:1, 4:1, 3:1, 2:1, 1.5:1 respectively).

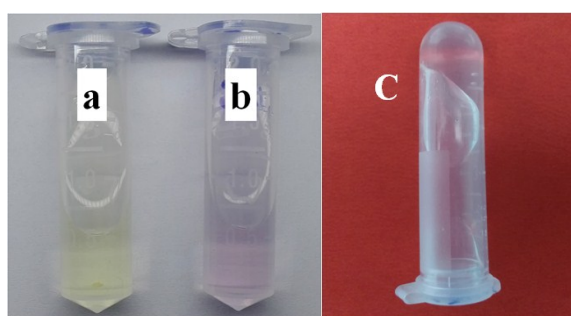


Figure S2. The photographs of (a) AuNCs@BSA/[C₄min], (b) CuNCs@BSA/[C₄min] and (c) gelatinous AgNCs@GSH/[C₂min] NPs synthesized in No. 2 concentration (Table S1, a) under visible light.

Table S1. The dosage of reagents in the preparation of MNCs(a) AgNCs@GSH/[C_nmim] NPs with different concentration of [C_nmim][BF₄] (*n*=2, 4)

No.	The Volume Ratio of water: [C ₄ mim][BF ₄]	AgNO ₃ (20 mM)	GSH (50 mM)	NaBH ₄ (60 mM)	[C _n mim][BF ₄]	H ₂ O
1	3:1	100 μL	120 μL	200 μL	450 μL	1350 μL
2	2:1	100 μL	120 μL	200 μL	600 μL	1200 μL
3	1.5:1	100 μL	120 μL	200 μL	720 μL	1080 μL

(b) AgNCs@GSH/[C_nmim] (*n*=2, 4)

AgNO ₃ (20 mM)	GSH (50 mM)	NaBH ₄ (86 mM)	[C _n mim][BF ₄]	H ₂ O
30 μL	100 μL	100 μL	600 μL	1200 μL

(c) AuNCs@BSA/[C₄mim]

HAuCl ₄ (50mg/mL)	BSA (20mg/mL)	NaOH (2 M)	[C ₄ mim][BF ₄]	H ₂ O
30 μL	450 μL	100 μL	600 μL	820 μL

(d) CuNCs@BSA/[C₄mim]

CuSO ₄ (50mM)	BSA (20mg/mL)	NaOH (2 M)	[C ₄ mim][BF ₄]	H ₂ O
30 μL	450 μL	200 μL	600 μL	720 μL

(e) AuNCs@BSA/SDS

HAuCl ₄ (50mg/mL)	BSA (20mg/mL)	NaOH (2 M)	SDS (50 mM)
30 μL	450 μL	100 μL	1420 μL

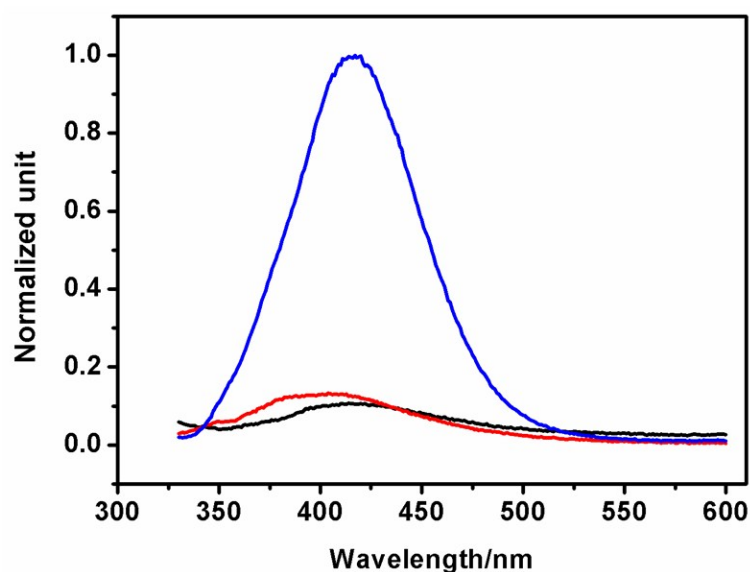


Figure S3. The fluorescence spectra of AgNCs@GSH/[C₂mim] NPs synthesized in No. 2 concentration (blue line), AgNCs@GSH/[C₂mim] (red line) and AgNCs@GSH/[C₄mim] (black line). AgNCs@GSH/[C_nmim] was synthesized in a low concentration (Table S1, b).

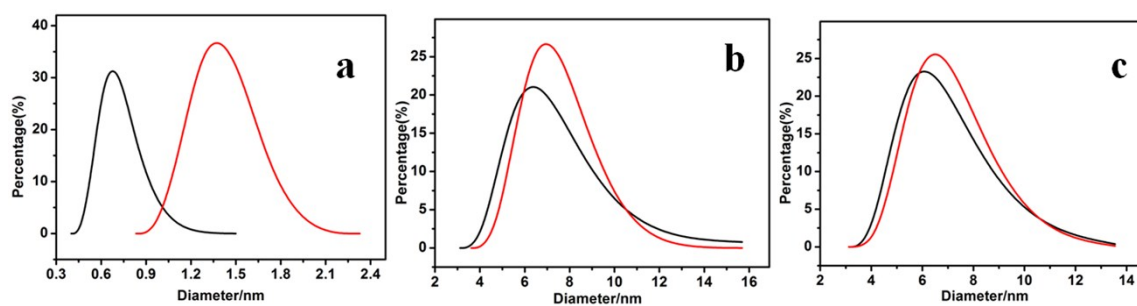


Figure S4. The size distribution of MNCs: (a) AgNCs@GSH/[C₂mim] synthesized in a low concentration (Table S1, b). (b) AuNCs@BSA/[C₄mim]. (c) CuNCs@BSA/[C₄mim]. (Red line: MNCs@template molecule, black line: MNCs@template molecule/ILs.)

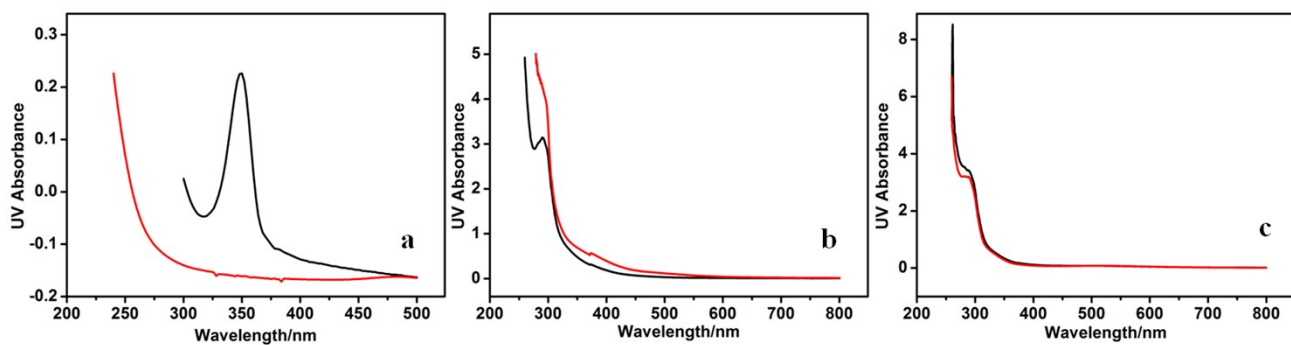


Figure S5. The UV/Vis absorption spectra of MNCs

(a) The UV/Vis absorption spectra of AgNCs@GSH/[C₂mim] NPs (black line) and AgNCs@GSH (red line).

(b) The UV/Vis absorption spectra of AuNCs@BSA/[C₄mim] (black line) and AuNCs@BSA (red line).

(c) The UV/Vis absorption spectra of CuNCs@BSA/[C₄mim] (black line) and CuNCs@BSA (red line).

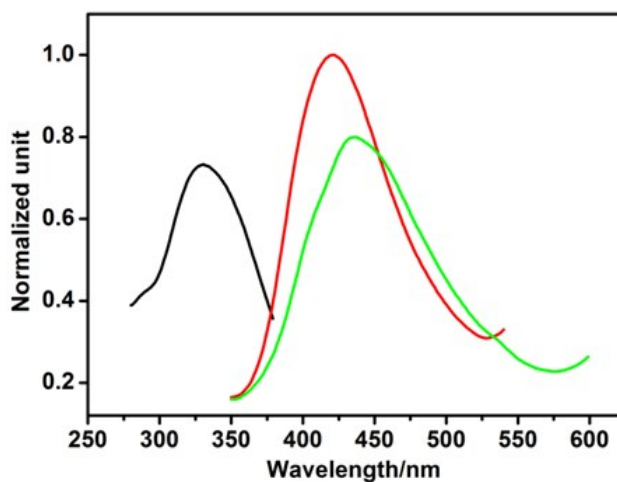


Figure S6. The emission spectra (423nm) of AuNCs@BSA (red line), the emission spectra (436nm) of AuNCs@BSA/SDS (green line) and the excitation (327nm) of AuNCs@BSA/SDS (black line).

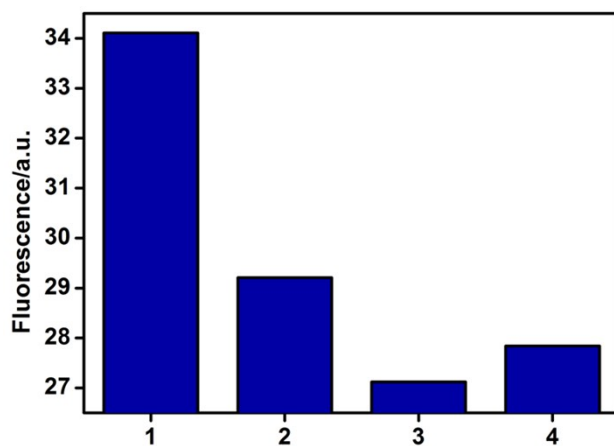


Figure S7. The fluorescence intensity of AuNCs@BSA after adding various concentrations of [C₄mim][BF₄]. The volumes of the reagents were provided in **Table S2**.

	AuNCs@BSA	H ₂ O	[C ₄ mim][BF ₄]
1	210 μL	90 μL	0 μL
2	210 μL	80 μL	10 μL
3	210 μL	40 μL	50 μL
4	210 μL	0 μL	90 μL

Table S3. The zeta potential of the MNCs

Sample	AgNCs@GSH	AgNCs@GSH/ [C ₂ mim] NPs	AuNCs@BSA	AuNCs@BSA/ [C ₄ mim]	CuNCs@BSA	CuNCs@BSA/ [C ₄ mim]
Zeta potential (mV)	-8.9	27.0	-18.0	-6.5	-15.1	-4.6

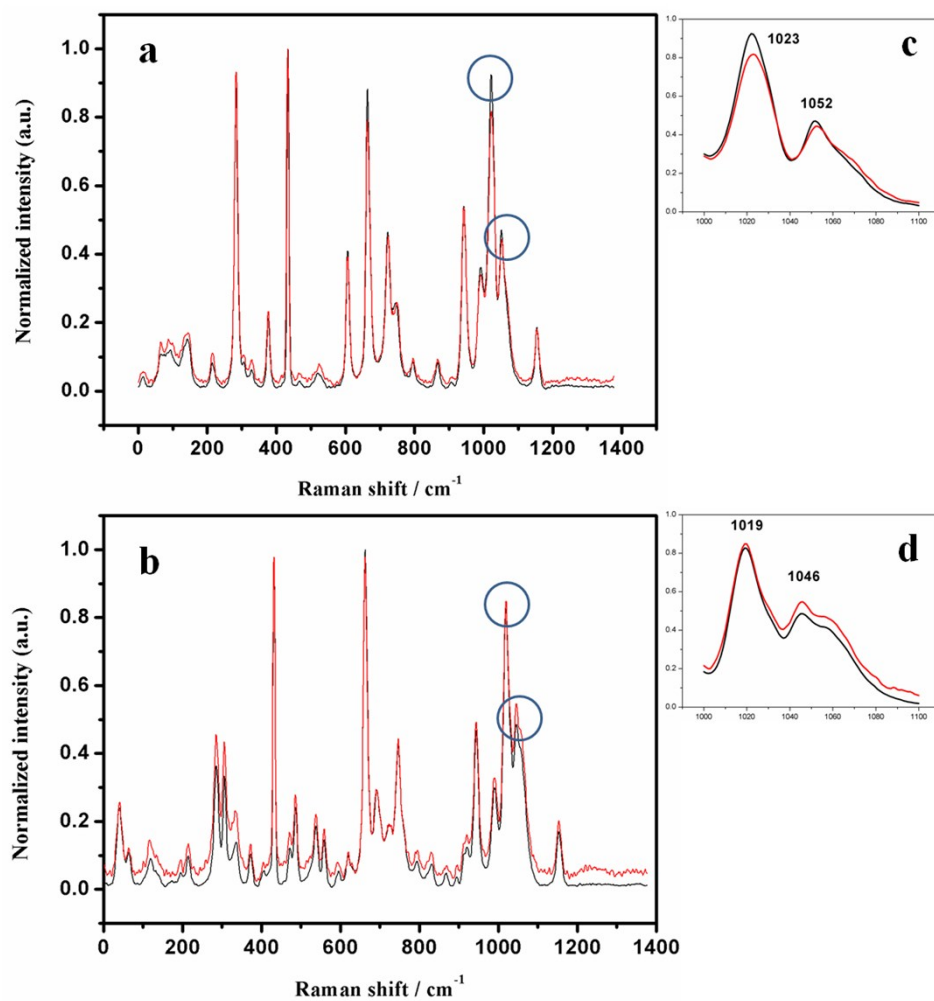


Figure S8. Raman spectrum

(a) $[\text{C}_2\text{mim}]\text{BF}_4$ (the black line) and GSH/ $[\text{C}_2\text{mim}]$ complex (the red line).

(b) $[\text{C}_4\text{mim}]\text{BF}_4$ (the black line) and BSA/ $[\text{C}_4\text{mim}]$ complex (the red line).

The peaks circled were showed in c and d. The concentrations of all the substances were identical with the ones in the corresponding synthesis system (Table S1, b and c).