Green and Facile Synthesis of Highly Stable Gold Nanoparticles via Hyperbranched Polymer In-situ Reduction and Their Application in Ag^+ Detection and Separation

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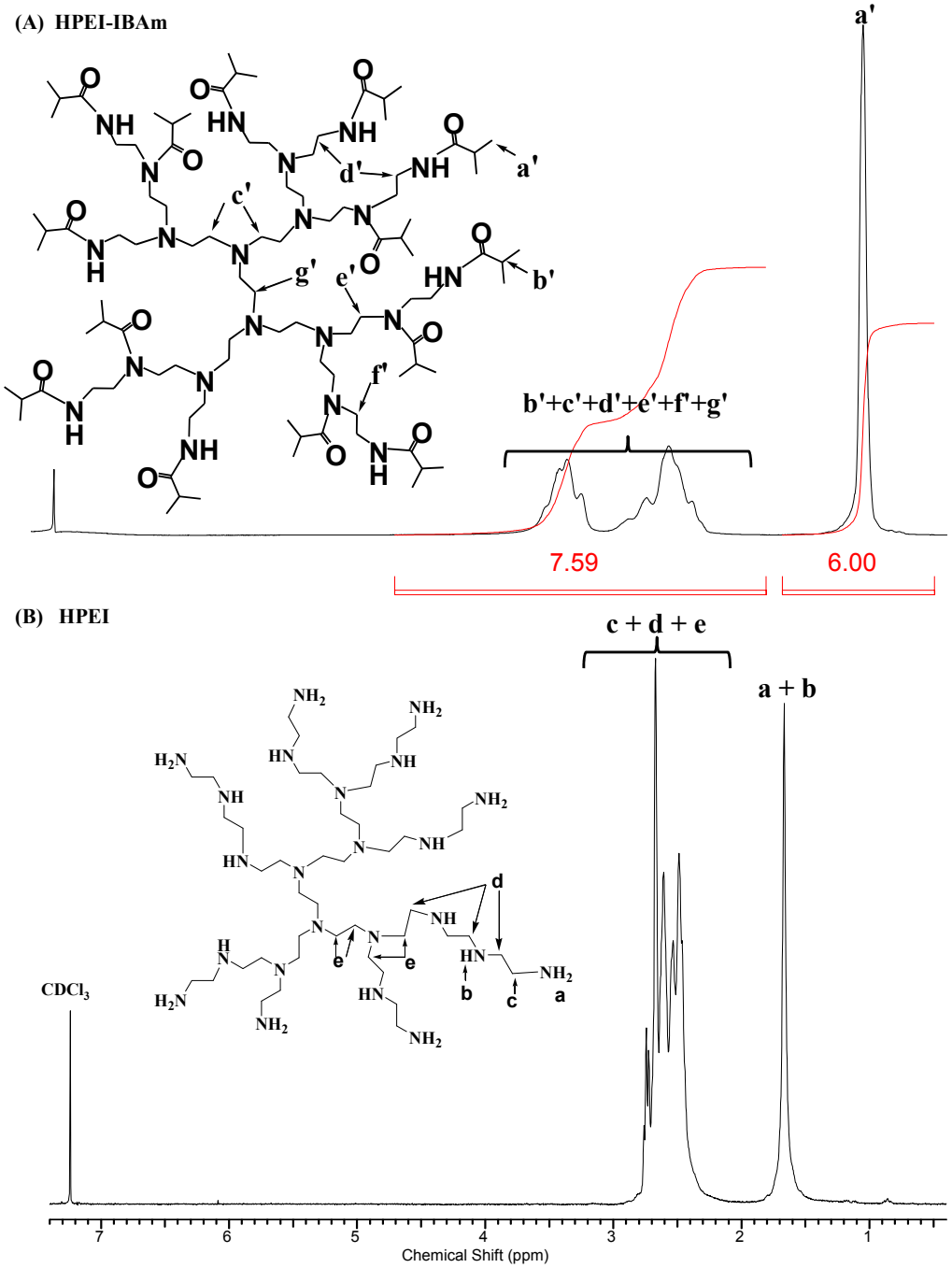

Figure S1. 1H NMR spectra of HPEI-IBAm (A) and HPEI (B).

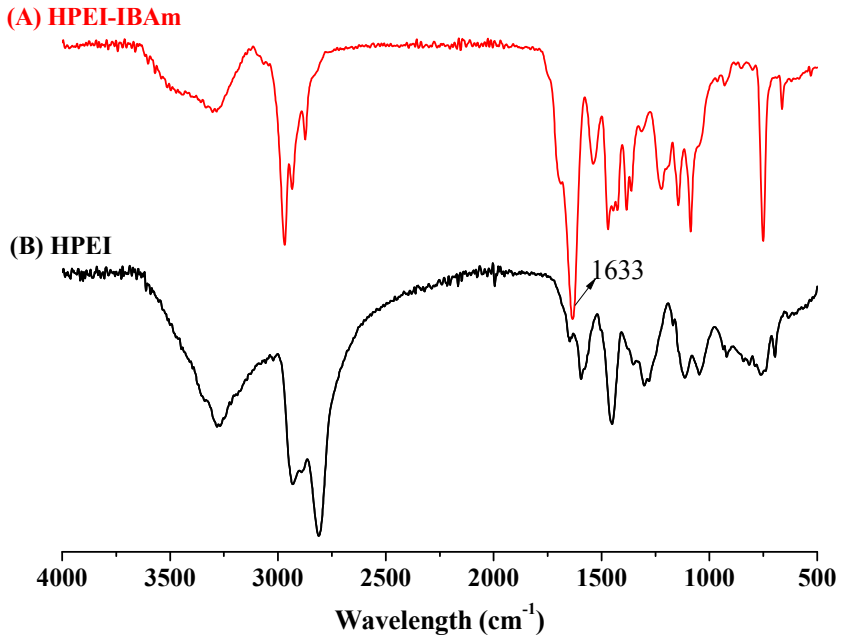

Figure S2. Comparison of FTIR spectra of HPEI-IBAm (A) and HPEI (B).

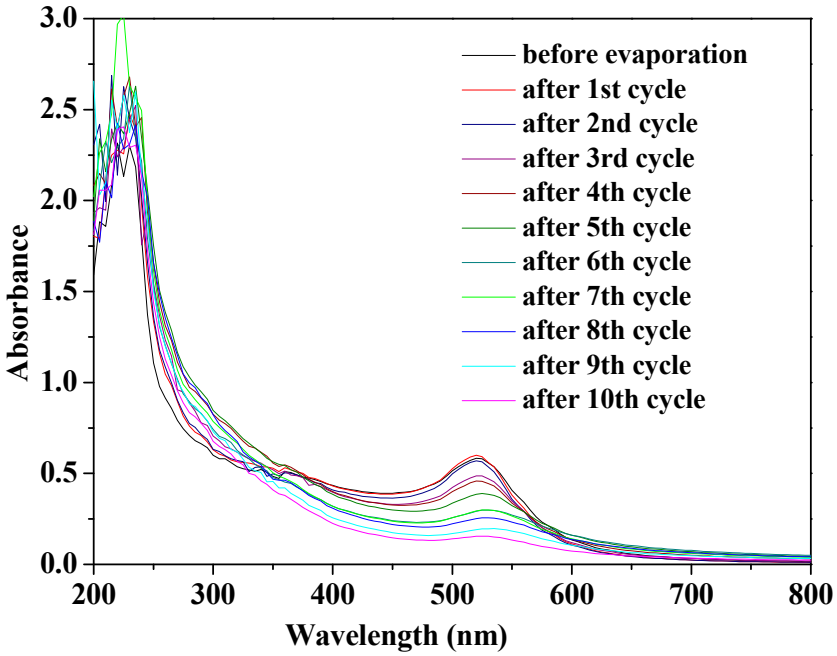

Figure S3. The UV-Vis spectra of the HPEI-IBAm functionalized AuNPs after every evaporation at 110 °C and re-dispersion in Milli-Q water.

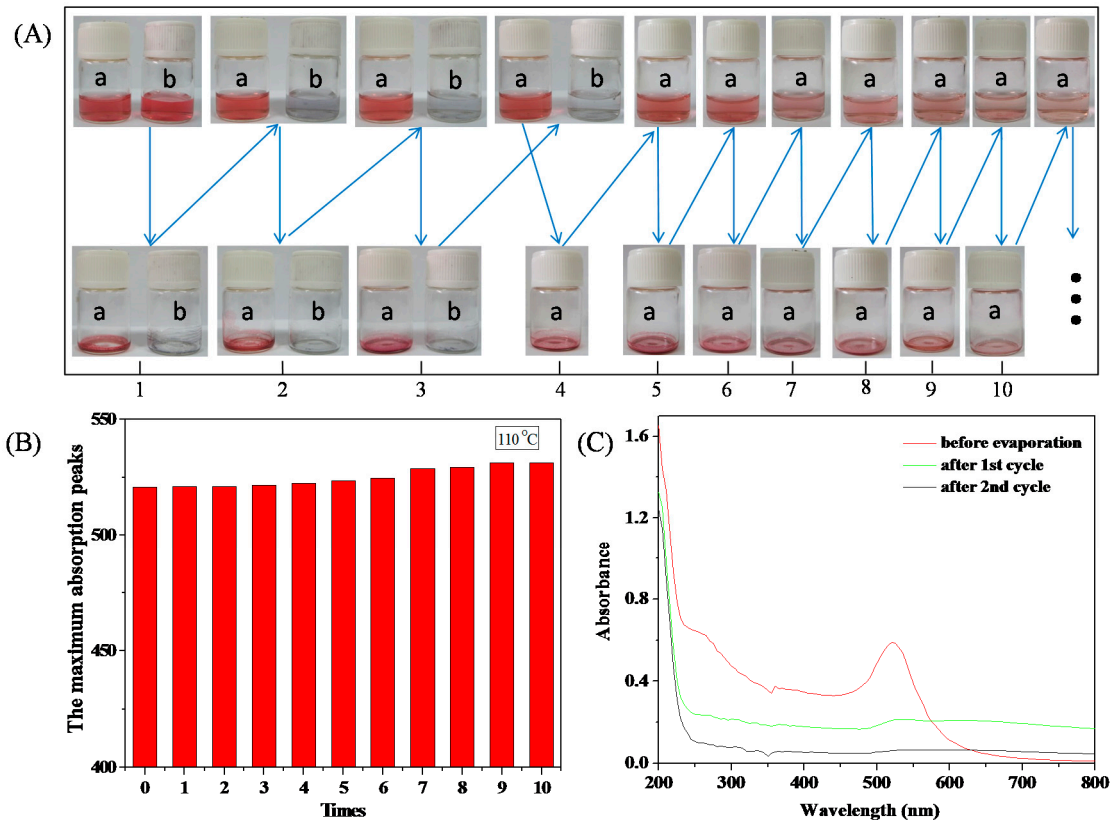

Figure S4. (A) Photographs of (a) the HPEI-IBAm functionalized AuNPs and (b) citrate-capped AuNPs after every evaporation at 110 °C and re-dispersion in Milli-Q water; (B) The maximum absorption peaks of the HPEI-IBAm functionalized AuNPs after each cycle's re-dispersion; (C) The UV-Vis spectra of the citrate-capped AuNPs after each cycle's re-dispersion.

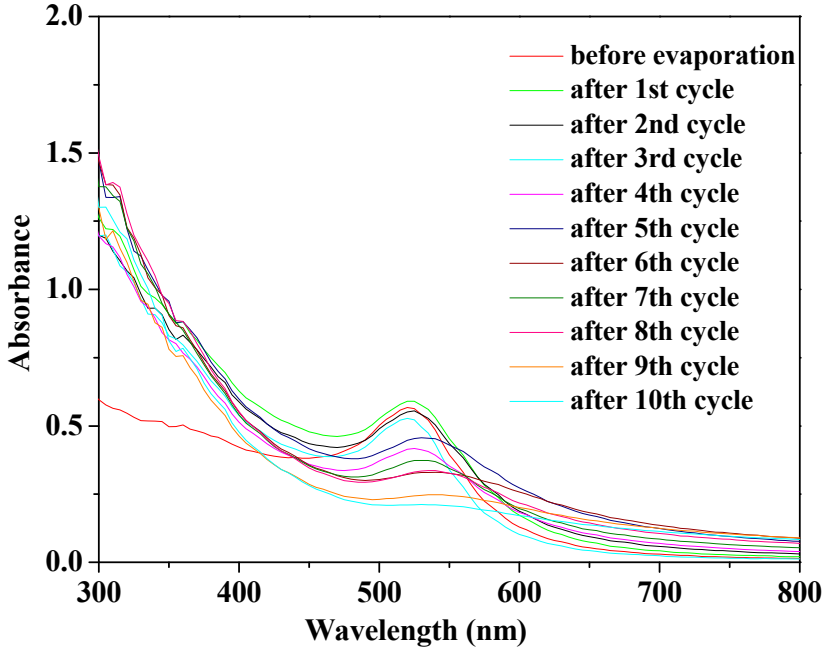

Figure S5. The UV-Vis spectra of the HPEI-IBAm functionalized AuNPs after every evaporation at

130 °C and re-dispersion in Milli-Q water.

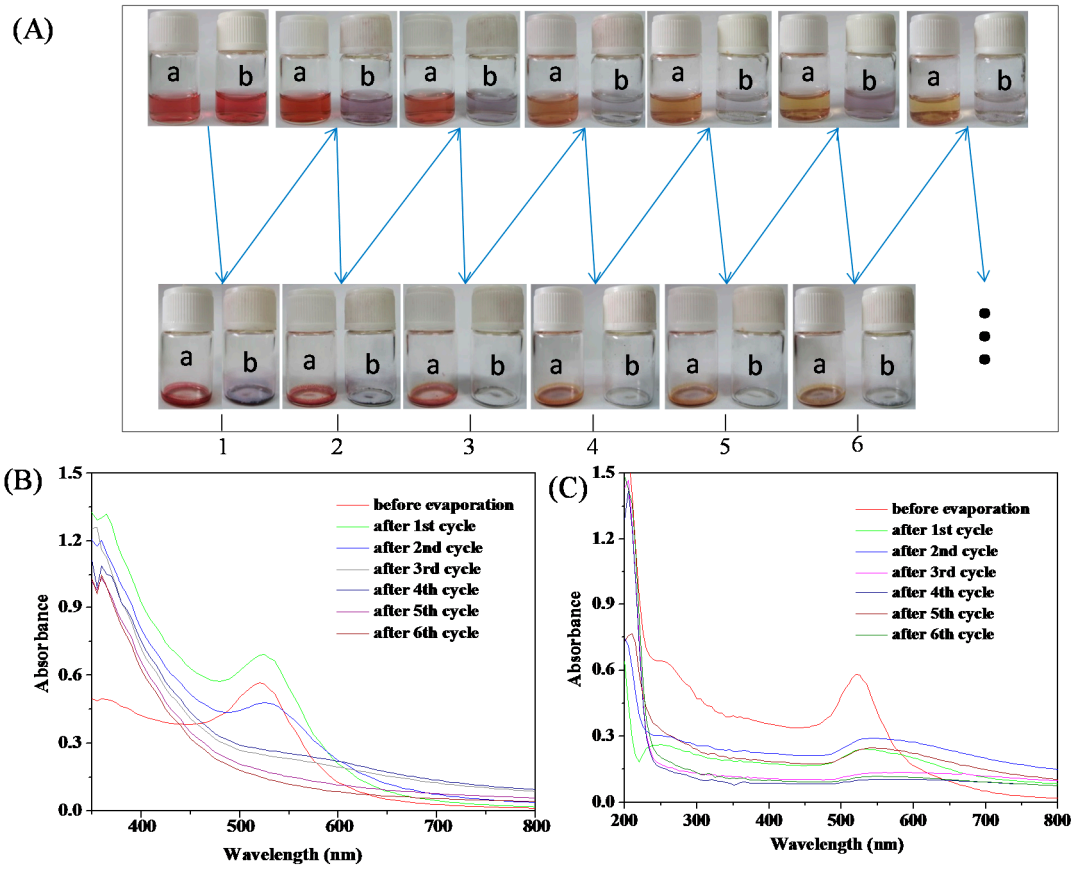

Figure S6. (A) Photographs of (a) the HPEI-IBAm functionalized AuNPs and (b) citrate-capped AuNPs after every evaporation at 200 °C and re-dispersion in Milli-Q water; (B) The UV-Vis spectra of the HPEI-IBAm functionalized AuNPs after each cycle's re-dispersion; (C) The UV-Vis spectra of the citrate-capped AuNPs after each cycle's re-dispersion.

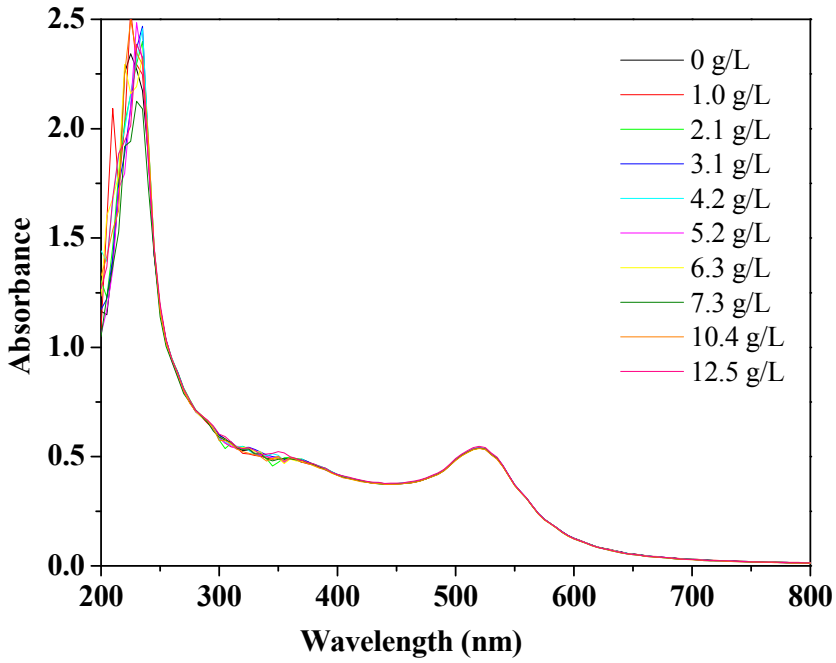

Figure S7. The UV-Vis spectra of the HPEI-IBAm functionalized AuNPs under different salt concentrations.

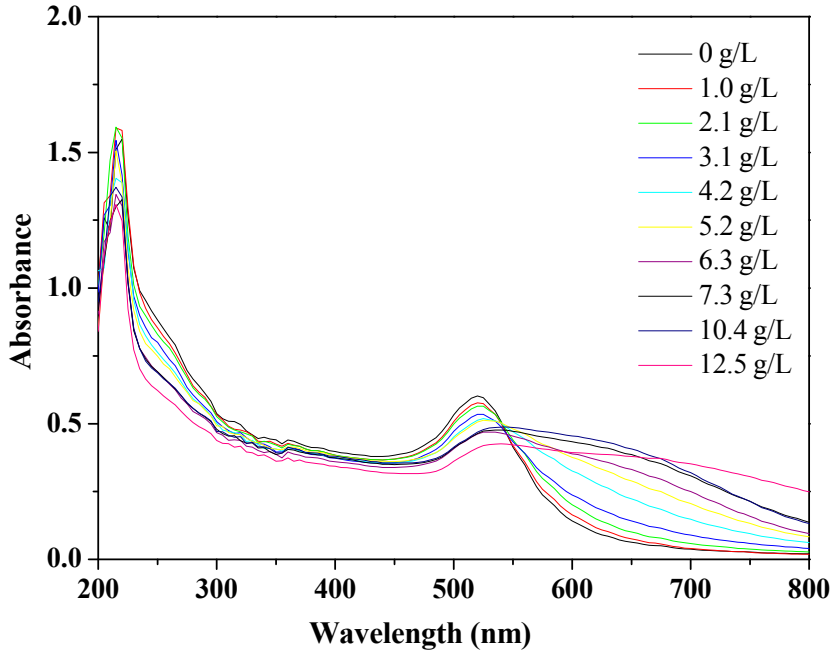

Figure S8. The UV-Vis spectra of the citrate-capped AuNPs after 24 h under different salt concentrations.

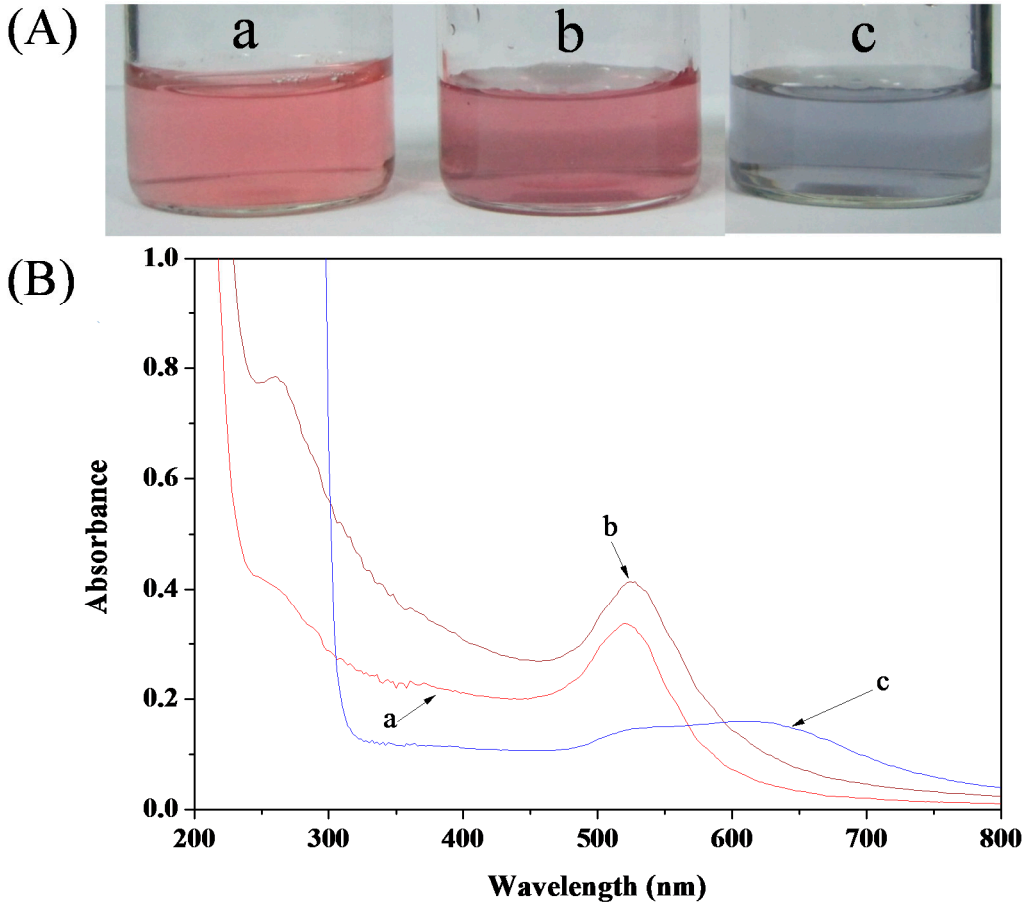

Figure S9. (A) Photographs and (B) UV-Vis spectra of (a) 1.2 nM citrate-capped AuNPs after (b) 1 h and (c) 24 h upon the addition of Ag+.

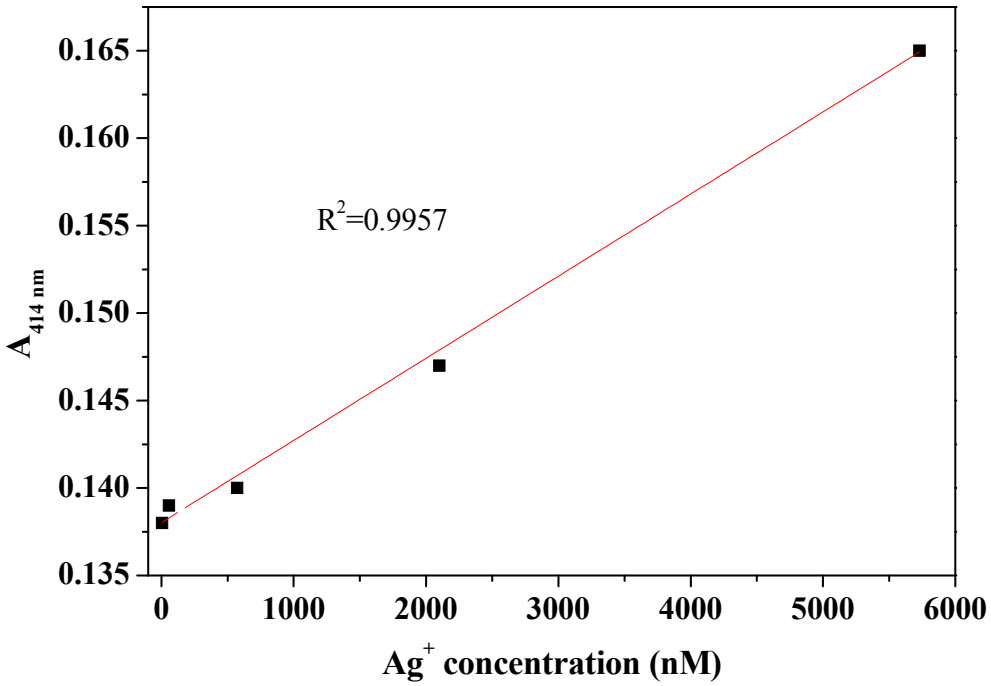

Figure S10. Linear response (A414 nm value of the absorbance at 414 nm) of the colorimetric assay against the Ag+ concentration range of 5.73 nM to 5.73 M.

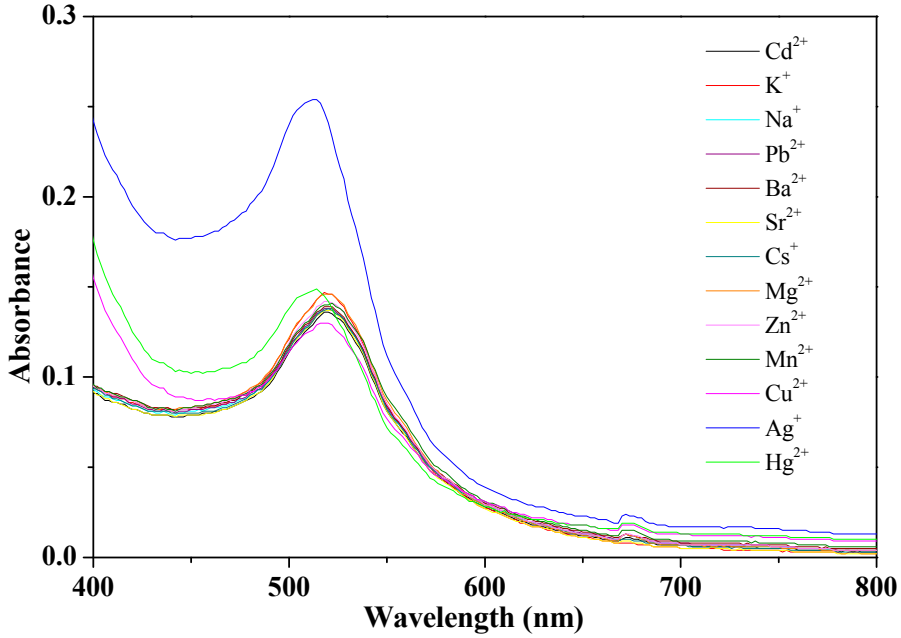

Figure S11. UV-Vis spectra of 0.49 nM HPEI-IBAm-AuNPs solution in the presence of various metal ions at the concentrations of 57.3 M.

Table S1. Colorimetric sensors for Ag+ detection.

Probe	Detection techniques	LOD (nM)	Detection range	Ref
Tween 20-AuNPs	Colorimetry and absorption	100	400-1000 nM	[1]
Pyridines-functionalized AuNPs	Colorimetry and absorption	1000	—[a]	[2]
Oligonucleotide/AuNPs	Colorimetry	62	0.13-1.12 μM	[3]
Tween 20-AuNPs	Colorimetry and absorption	10	1-8 μM	[4]
Core-shell AuNPs	Absorption	10	10 nM-0.1 mM	[5]
Gold nanorod (GNR)	Absorption	10	10 nM-1 mM	[6]
Cationic polymer-directed AuNPs	Colorimetry and absorption	48.6	100-1000 nM	[7]
DNA probe and AuNPs	Colorimetry and absorption	500	1.5-4 μM	[8]
Multidentate ligand-AuNPs	Colorimetry and absorption	8.76	8.76 nM-0.13 mM	[9]
Thermoresponsive hyperbranched polymer-AuNPs	Colorimetry and absorption	7.22	0-2.0 mM	This work

[a]The detection range was not given.

References

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