Supporting Information for:

SiO_2-PDA-DDTC nanocomposite for efficient and selective recovery of silver from wastewater: Performance and mechanisms

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1 The method to measure the concentration of Ag^+ ions in aqueous solution by UV/Vis spectroscopy

The standard solutions of Ag^+ ions with varying concentrations were added to a 25 mL colorimetric tube which containing 2 ml of 1.0×10^{-4} mol/L tannic acid solution. Subsequently, 1ml of 1.0 mol/L NaOH solution was introduced to adjust the solution pH value to greater than 9. After it was stand for 30 minutes, the concentration of Ag^+ ions in the solution was measured using a UV-vis spectrophotometer (UV-2600, Shimadzu, Japan) at the characteristic wavelength of 415 nm. The linear relationship of the concentration of Ag^+ ions and absorbance is presented in Fig. S1. It indicated that the correlation coefficient (R^2) was 0.9995, suggesting that the method is suitable for determining of the concentration of Ag^+ ions.

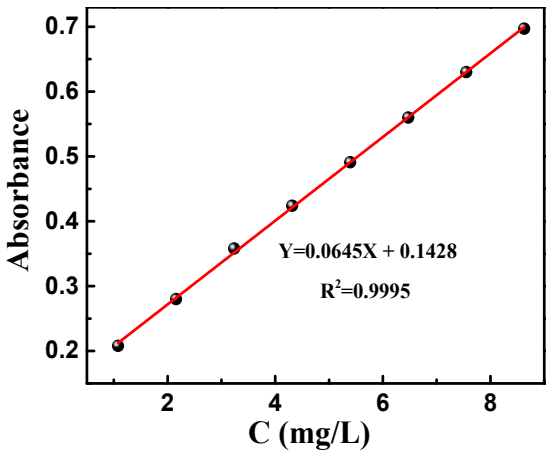

Fig. S1 Linear relationship of the Ag^+ ions concentration vs. absorbance.

2 Batch adsorption experiment

Table S1

The parameters of kinetic models for various temperatures.

T(°C)	$q_{e,exp}$ (mg/g)	Pseudo-first-order model			Pseudo-second-order model		
		$q_{e,cal}$ (mg/g)	k_1 (min^{-1})	R^2	$q_{e,cal}$ (mg/g)	k_2 ($mg \cdot g^{-1} \cdot min^{-1}$)	R^2
20	97.12	5.707	0.020	0.885	96.339	0.020	0.999
25	100.80	6.575	0.014	0.978	99.108	0.017	0.999
35	105.67	8.312	0.013	0.894	103.093	0.016	0.999

Table S2

The parameters of intraparticle diffusion model for various temperatures.

T(°C)	Stage I			Stage II		
	$K_{i,1}$	C_1 (mg/g)	R^2	$K_{i,2}$	C_3 (mg/g)	R^2
20	1.062	88.451	0.996	0.229	93.725	0.993
25	0.712	92.673	0.997	0.478	94.266	0.967
35	1.124	94.236	0.996	0.387	98.938	0.954

Table S3

The parameters of Langmuir and Freundlich models at different temperature.

T(°C)	Langmuir model			Freundlich model		
	K_L(L/mg)	Q_m (mg/g)	R^2	K_F(mg/g)	n	R^2
20	1.138	119.904	0.985	8.202	2.426	0.824
25	1.165	124.533	0.987	9.021	2.480	0.821
35	1.197	130.719	0.992	10.490	2.589	0.838

Table S4

Thermodynamics parameters for adsorption.

$\Delta H(kJ \cdot mol^{-1})$	$\Delta S(J \cdot mol^{-1} \cdot K^{-1})$	$\Delta G(kJ \cdot mol^{-1})$		
		293K	298K	308K
2.482	9.564	-0.321	-0.369	-0.465

3 Adsorption selectivity of SiO_2-PDA-DDTC nanoparticles

Table S5 The adsorption of SiO_2-PDA-DDTC nanoparticles on metal ions from their mixed solutions.

Metal ions	C_0 (mg/L)	C_e (mg/L)	Q_e (mg/g)	K_D (L/g)	K
Ag^+	216	54.52	96.89	1.777	1.00
Pb^{2+}	414	411.54	5.35	0.013	136.69
Cu^{2+}	128	124.80	1.56	0.0125	142.16
Co^{2+}	120	111.25	0.89	0.008	222.13
Ni^{2+}	120	110.00	0.55	0.005	355.40
Zn^{2+}	130	120.00	0.36	0.003	592.33
Mn^{2+}	110	108.70	0.25	0.0023	772.61
Na^+	46	45.45	0.10	0.0022	807.73

4 Element concentration of SiO_2-PDA-DDTC nanoparticles before and after treatment with Ag^+ ions

Table S6 Element concentration (%) of SiO_2-PDA-DDTC nanoparticles before and after treatment with Ag^+ ions which determined by XPS

Species	C 1s	O 1s	N 1s	Si 2p	S 2p	Ag 3d
SiO_2-PDA-DDTC nanoparticles	26.67	46.79	4.19	18.96	3.39	-
SiO_2-PDA-DDTC nanoparticles-Ag(I)	33.51	37.08	4.50	15.50	5.29	4.10