SUPPORTING INFORMATION

Gram-negative *Escherichia coli* promotes deposition of polymer-capped silver nanoparticles in saturated porous media

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1. A method to analyze the concentration of a mixture using a UV-vis spectrophotometer (Ad-Duri et al., 1992)

For the co-injection experiments, co-occurrence of the AgNP and the bacterial cell in column effluent may cause mutual optical interference. Consequently, an approach presented by Ad-Duri et al. (1992) was applied to quantify the effluent concentration of the two particles. This approach involves the following steps: 1. full scanning to determine the characteristic wavelength of AgNP and *E.coli* to be λ_1=425 nm and λ_2=260 nm, respectively; 2. determine the slopes of the calibration line of AgNP and *E.coli* at λ_1 and λ_2 to be K_{A1}=0.0598，K_{A2}=0.0194，K_{B1}=0.0025，K_{B2}=0.0059; 3. During column experiment, the optical density of every effluent sample was measured at λ_1 and λ_2 to obtain d_1 and d_2; 4. substituting the values of the above parameters into the following equations to calculate the concentration of AgNP and E.coli in every sample:

$$CA=\frac{KB1d1-KB2d2}{KA1KB2-KA2KB1} \quad (1)$$

$$CB=\frac{KA1d2-KA2d1}{KA1KB2-KA2KB1} \quad (2)$$

2. Supporting Tables

Table S1 Attachment coefficients of AgNP and *E.coli* within a glass bead matrix*

Type of granule beds	AgNP		*E.coli*	
	without *E.coli*	with *E.coli*	without AgNP	with AgNP
Glass beads	0.15	0.20	0.02	0.02
Iron oxide glass beads	0.24	0.63	0.27	0.27
Natural sand	0.52	0.55	0.69	0.73

* Calculation used the correlation equation of Tufenkji and Elimelech (2004). Values of main parameters are: diameters of AgNP and *E.coli* are 104 nm and 1319 nm. Glass bead diameter is 0.12 mm. Number-averaged diameter of natural sand is 0.18 mm. Porosities of glass beads and natural sand are 0.37 and 0.31. Flow rate is 1 mL/min.

Table S2 Inorganic analysis of the chemical composition of the groundwater

Ions/ionic compounds	Mass concentration (mg/L)	Molar concentration （mM）
Ca	146.36	3.66
Na	31.83	1.38
Mn	2.60	0.05
Fe	1.69	0.03
S	25.24	0.79
Cl	15.69	0.37
SO_4^{2-}	8.50	0.08
HCO_3^-	220.34	3.61

Table S3 Organic analysis of the elemental composition of the groundwater

Element	C (%)*	H(%)*	N(%)*	O(%)*	C/H **	C/N**
Water sample	1.3	7.9	1.4	N/A	0.01	1.1

* Percentage by weight; ** atomic ratio. The very low C/H ratio (0.01) indicates the humic acid has low aromatic carbon content.

3. Supporting Figures

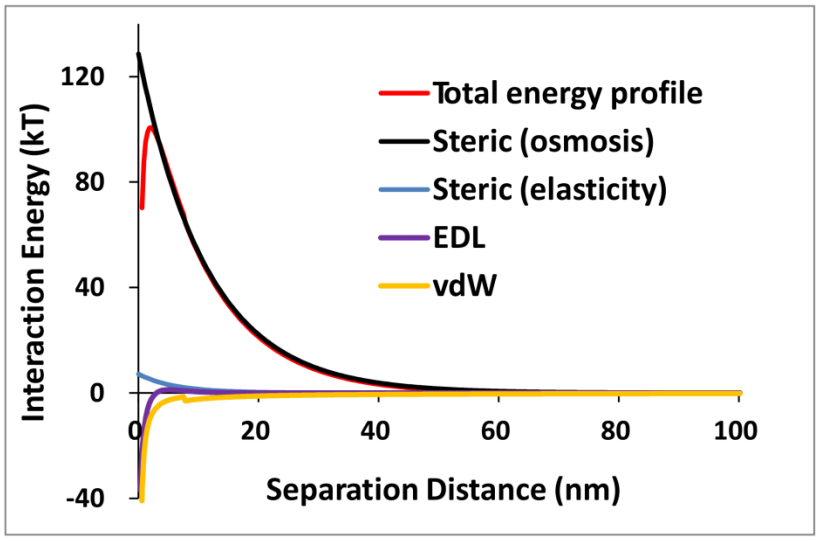

Figure S1 Energy profiles operating at the AgNP-*E.coli* interface, calculated using the Extended DLVO theory considering the steric effect (Lin and Wiesner, 2012). Results show that steric interaction (particularly the osmosis component) between the polymer coating of AgNP and the bacteria was a major contributor to the total energy barrier. Values of main parameters used in caltulation are as follows: AgNP core diameter 52 nm, Hamaker constant 2.25E-20 J, zeta potentials -48 mV for bacteria and -46 mV for AgNP. Polymer coating layer thickness 25 nm.

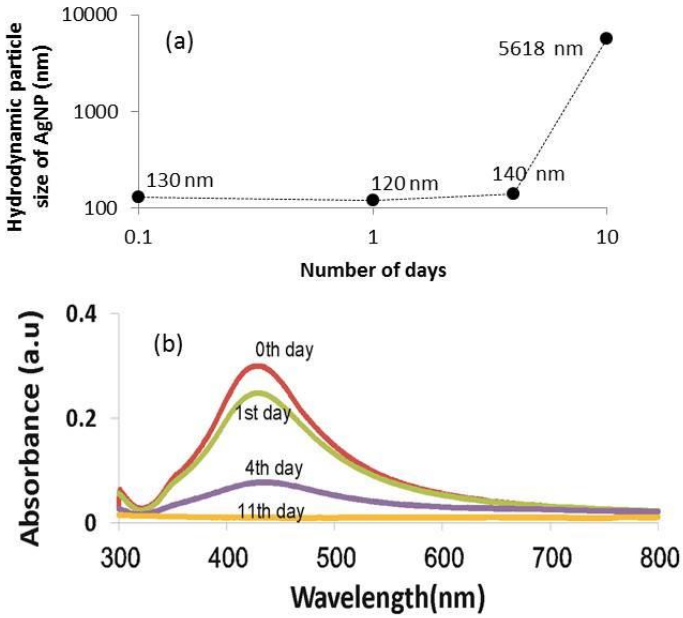

Figure S2 Evolution of hydrodynamic particle size (a) and UV absorbance (b) of AgNPs dispersed in natural groundwater over a period of 11 days.