Electronic Supplementary Material (ESI) for Environmental Science: Nano.

Determination of Inequable Fate and Toxicity of Ag Nanoparticles in *Phanerochaete chrysosporium* Biofilm System through Different Sulfide Sources

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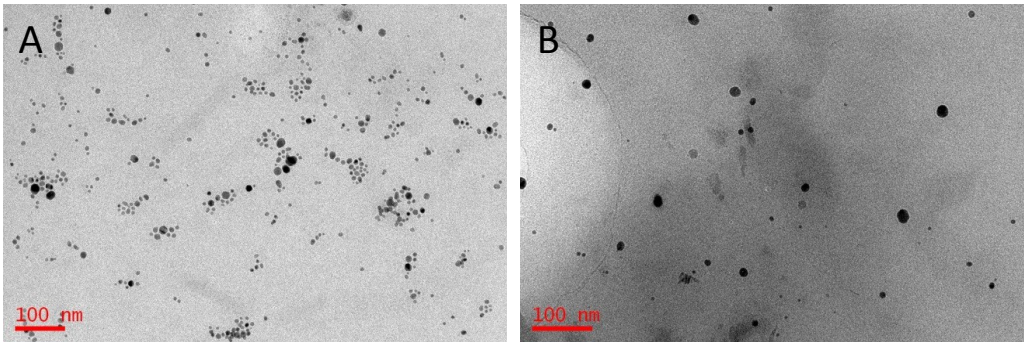

Figure S1. TEM of PVP-AgNP (A) and Cit-AgNP (B).

Table S1. Characterization of PVP- and Cit-AgNP stock suspensions changes.

PVP-AgNP	**Just Synthesis**	**1 Month**	**3 Month**	**5 Month**
Particle size (nm, by DLS)	39.8 ± 4.3	40.1 ± 6.8	40.9 ± 2.5	41.6 ± 5.2
Zeta-potential (mV)	-17.3 ± 1.8	-16.0 ± 2.2	-16.2 ± 1.5	-16.5 ± 1.3
Dissolved Ag^+ (µg/L)	1.78 ± 0. 15	1.83 ± 0.09	2.11 ± 0.17	2.42 ± 0.21
Cit-AgNP	**Just Synthesis**	**1 Month**	**3 Month**	**5 Month**
Particle size (nm, by DLS)	24.5 ± 2.7	24.9 ± 1.8	25.7 ± 2.4	27.4 ± 4.6
Zeta-potential (mV)	-15.6 ± 0.6	-15.9 ± 1.7	-14.4 ± 2.3	-15.1 ± 1.0
Dissolved Ag^+ (µg/L)	0.52 ± 0.06	0.52 ± 0.04	0.57 ± 0.09	0.63 ± 0.08

Table S2. Relevant parameters of water sample.

Species	S^{2-}	Cl^{-}	PO_4^{3-}
Concentration	0.012 mg/L	0.010 mg/L	0.005 mg/L
Species	Cysteine	Ag^{+}	Total Ag
Concentration	–	0.135 μg/L	0.264 μg/L

– indicates no signal was detected.

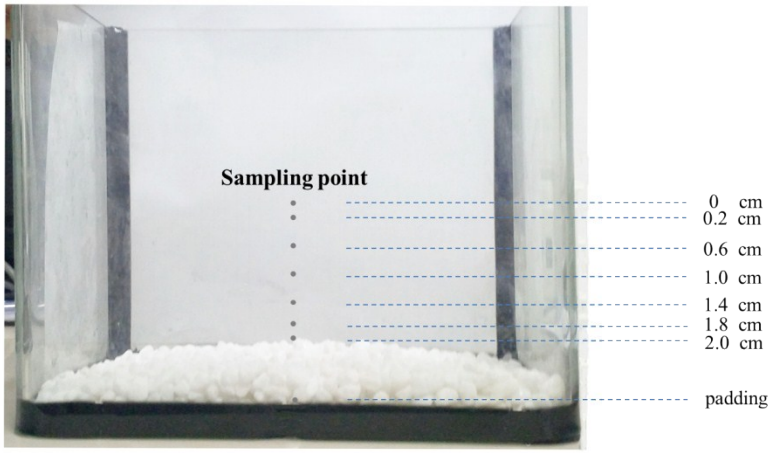

Figure S2. Schematic of the designed microcosm.

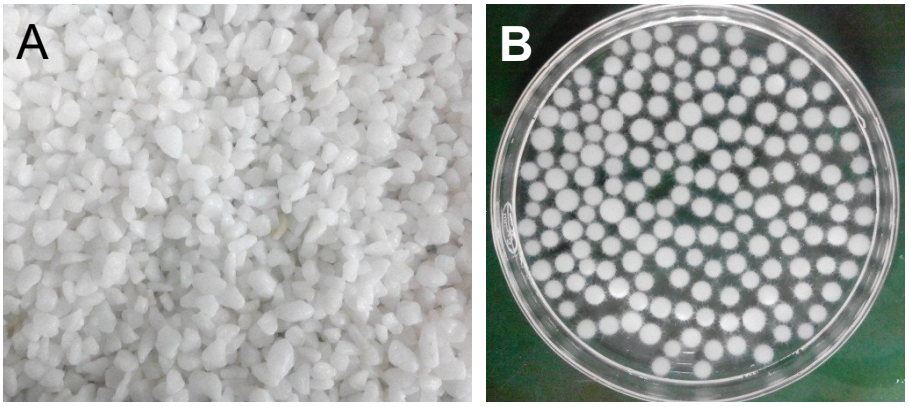

Figure S3. Photographs of quartz sands (A) and *P. chrysosporium* pellets (B).

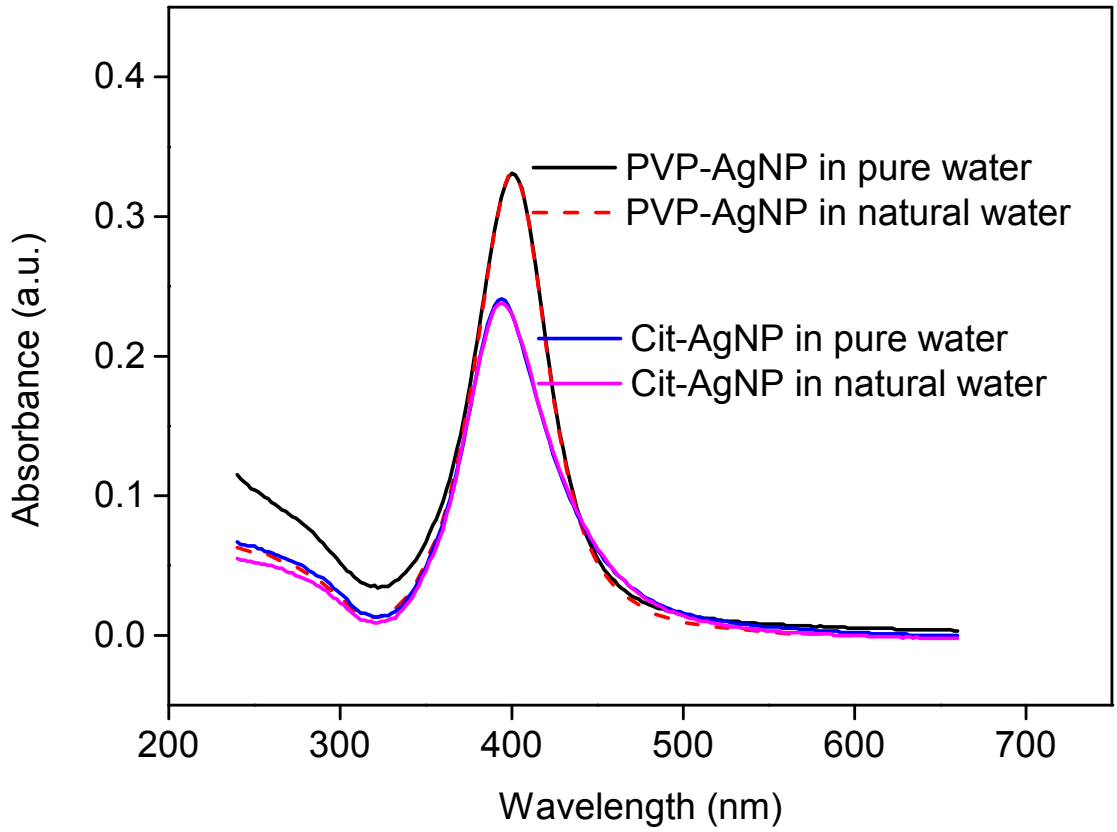

Figure S4. LSPR absorbance of PVP-AgNP and Cit-AgNP in pure water and natural water. The concentration of both AgNP was 2 mg/L in a consistent volume of 4 mL water sample. Data was measured after 2 h reaction.

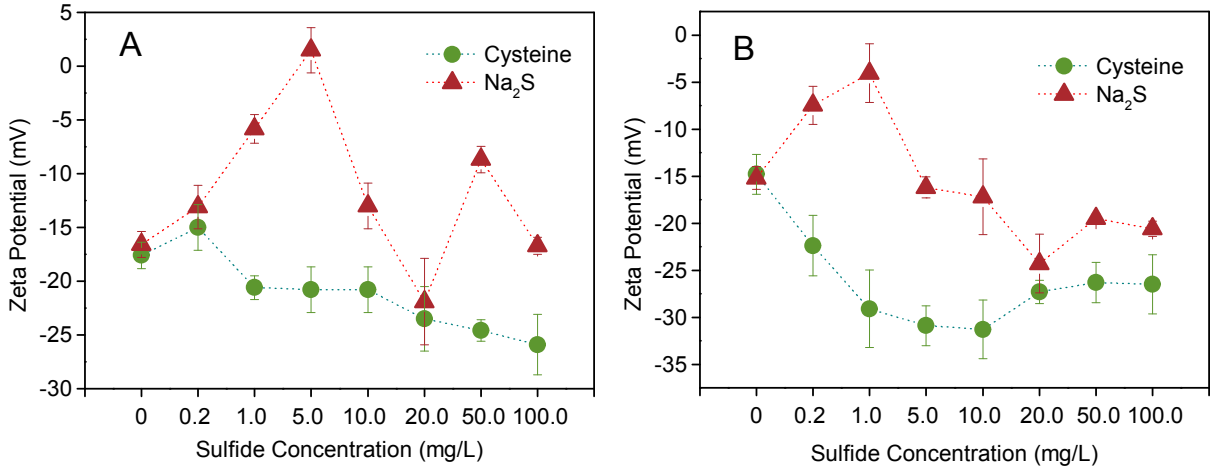

Figure S5. Zeta potential of the identical samples of PVP-AgNP (A) and Cit-AgNP (B) after adding various concentrations of cysteine and Na_2S. Both AgNP concentrations were 2 mg/L.

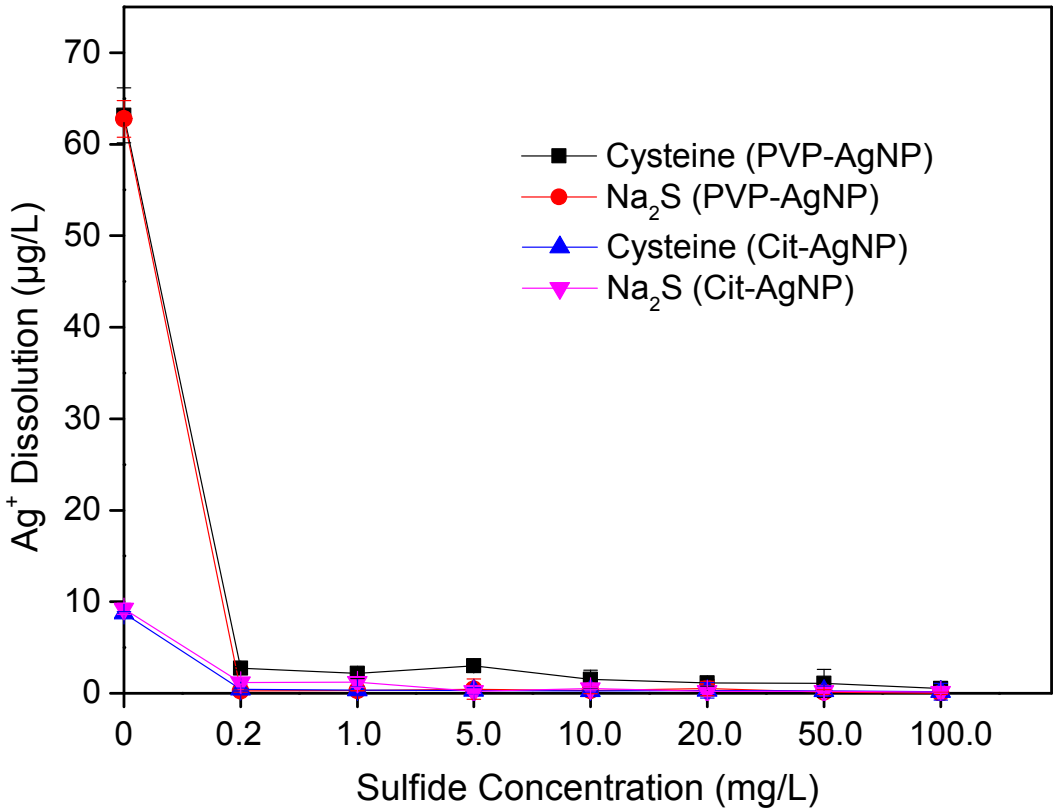

Figure S6. Dissolved silver concentrations after ultrafiltration centrifugation at 2 h reaction with sulfide. The initial concentrations of PVP-AgNP and Cit-AgNP are 2 mg/L. Filtration leaves only free, uncomplexed silver. Error bars represent one standard deviation. Lines are to guide the eye.

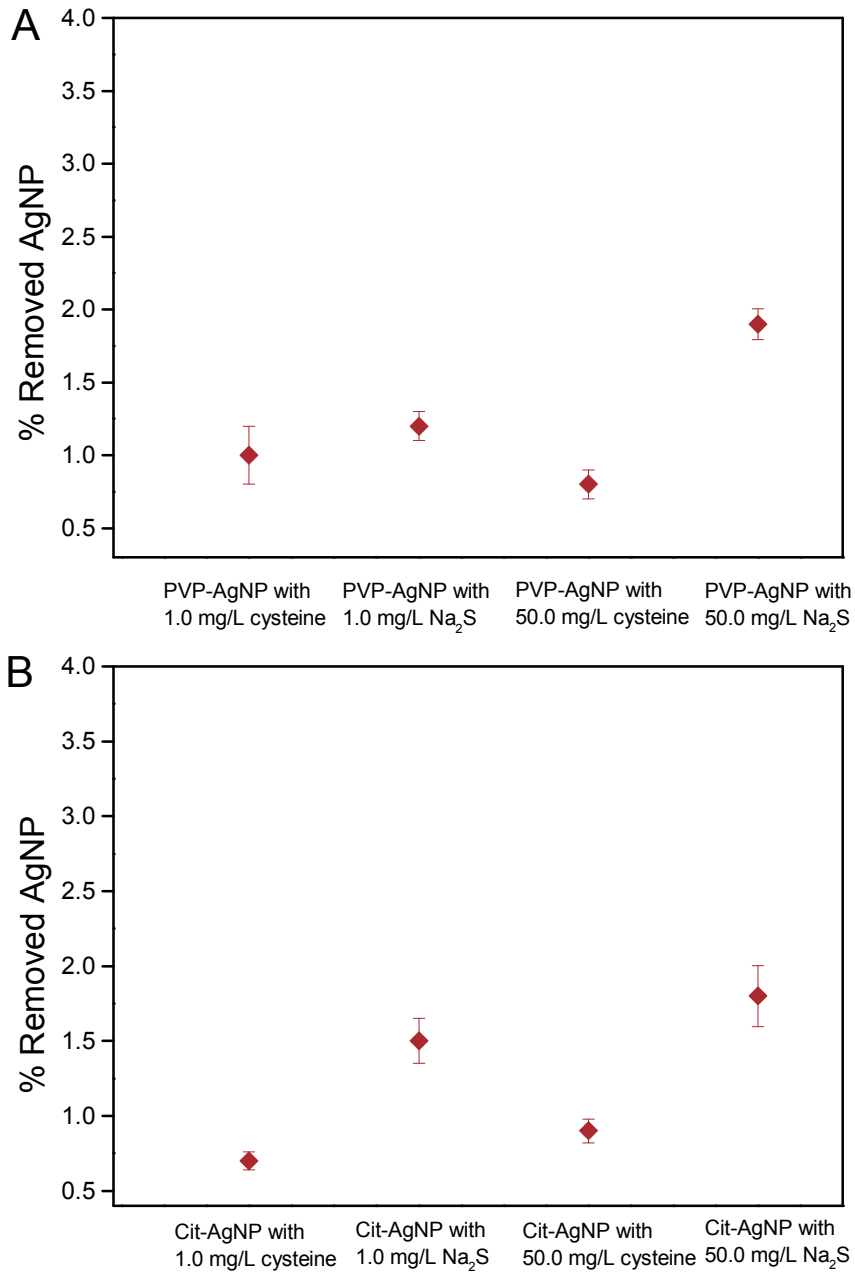

Figure S7. Reservation ratio of padding (quartz sands) for PVP-AgNP (A) and Cit-AgNP (B) after adding 1.0 and 50.0 mg/L cysteine and Na_2S. Both AgNP concentrations were 2 mg/L. The error bars represent 95% confidence intervals.

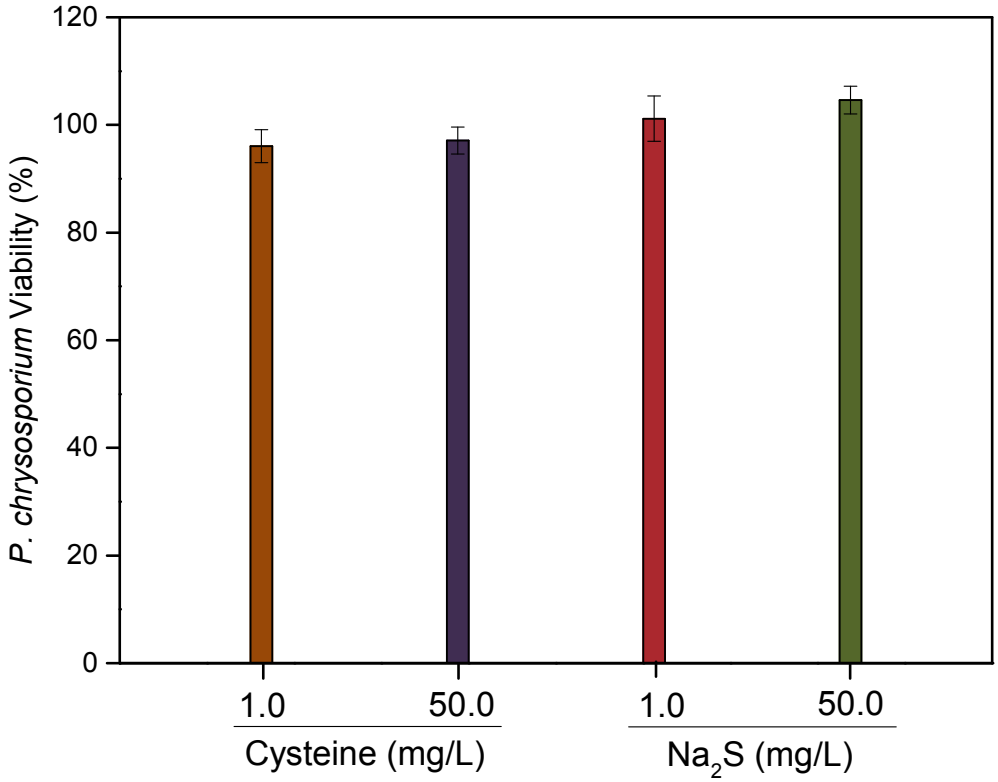

Figure S8. Effect of cysteine (1.0 and 50.0 mg/L) and Na_2S (1.0 and 50.0 mg/L) on the viability of *P. chrysosporium* cell. The viability of blank sample was set as 100% and the viability of treated samples was a relative value comparing to the blank.

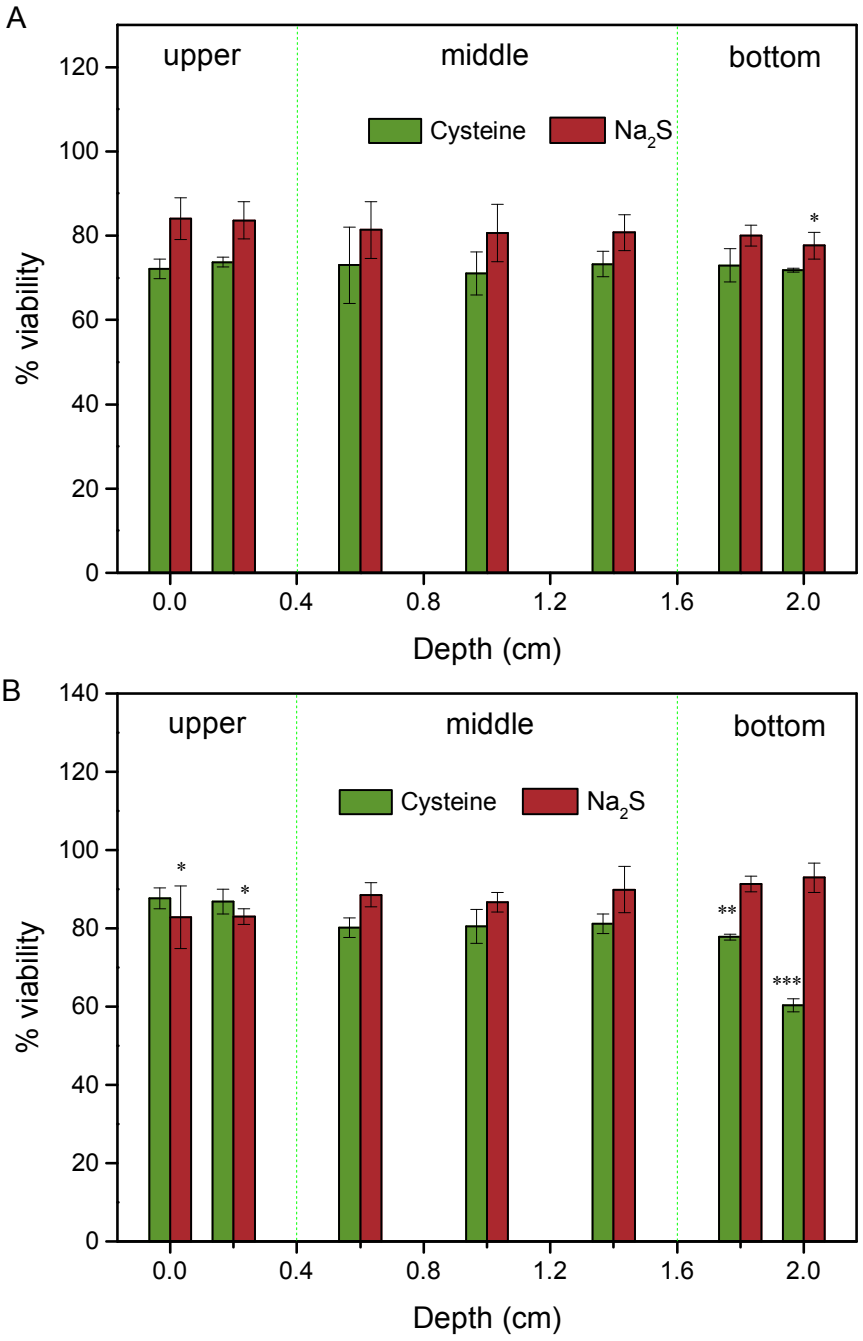

Figure S9. Cit-AgNP induced viability change of *P. chrysosporium* biofilm in the presence of 1.0 mg/L sulfide (A) and 50.0 mg/L sulfide (B). The viability of blank sample was set as 100%. The viability of treated samples was a relative value comparing to the blank. '*' denotes $p < 0.05$; '**' denotes $p < 0.01$; and '***' denotes $p < 0.001$ as compared to the viability of each depth; significant difference was analyzed by one-way ANOVA.

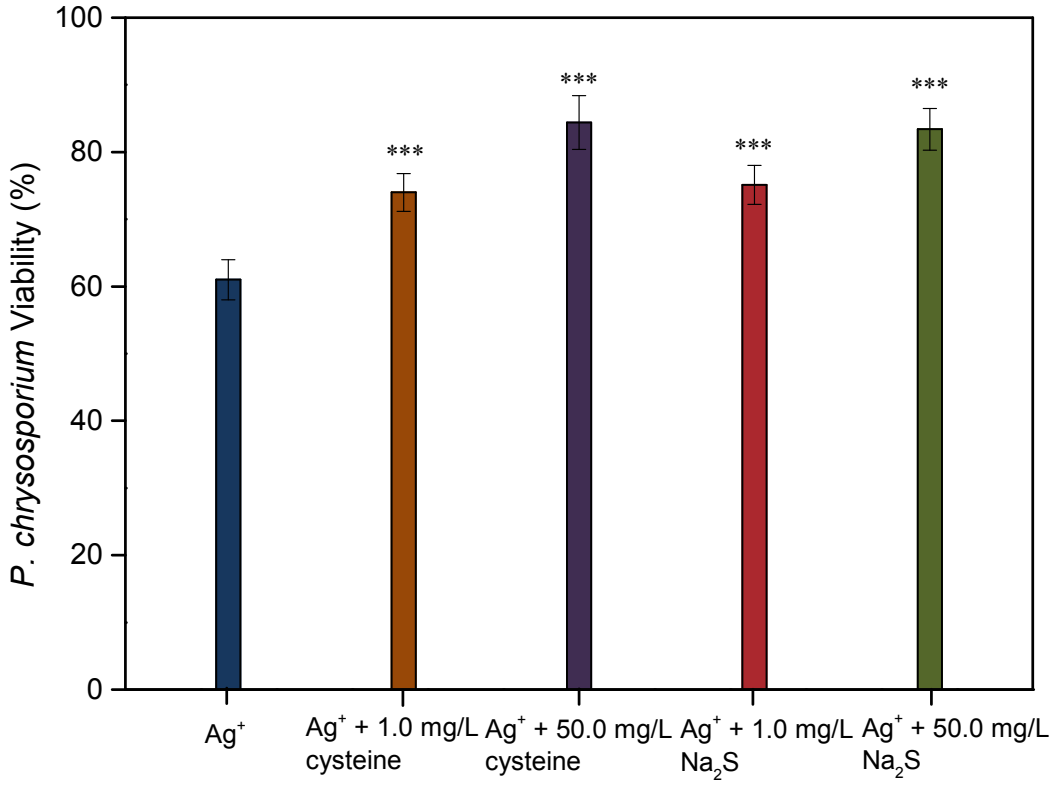

Figure S10. Effect of cysteine (1.0 and 50.0 mg/L) and Na_2S (1.0 and 50.0 mg/L) on the toxicity of Ag^+. The concentration was Ag^+ 500 μg/L. '***' denotes $p < 0.001$ as compared to the viability of blank (Ag^+ without sulfide).

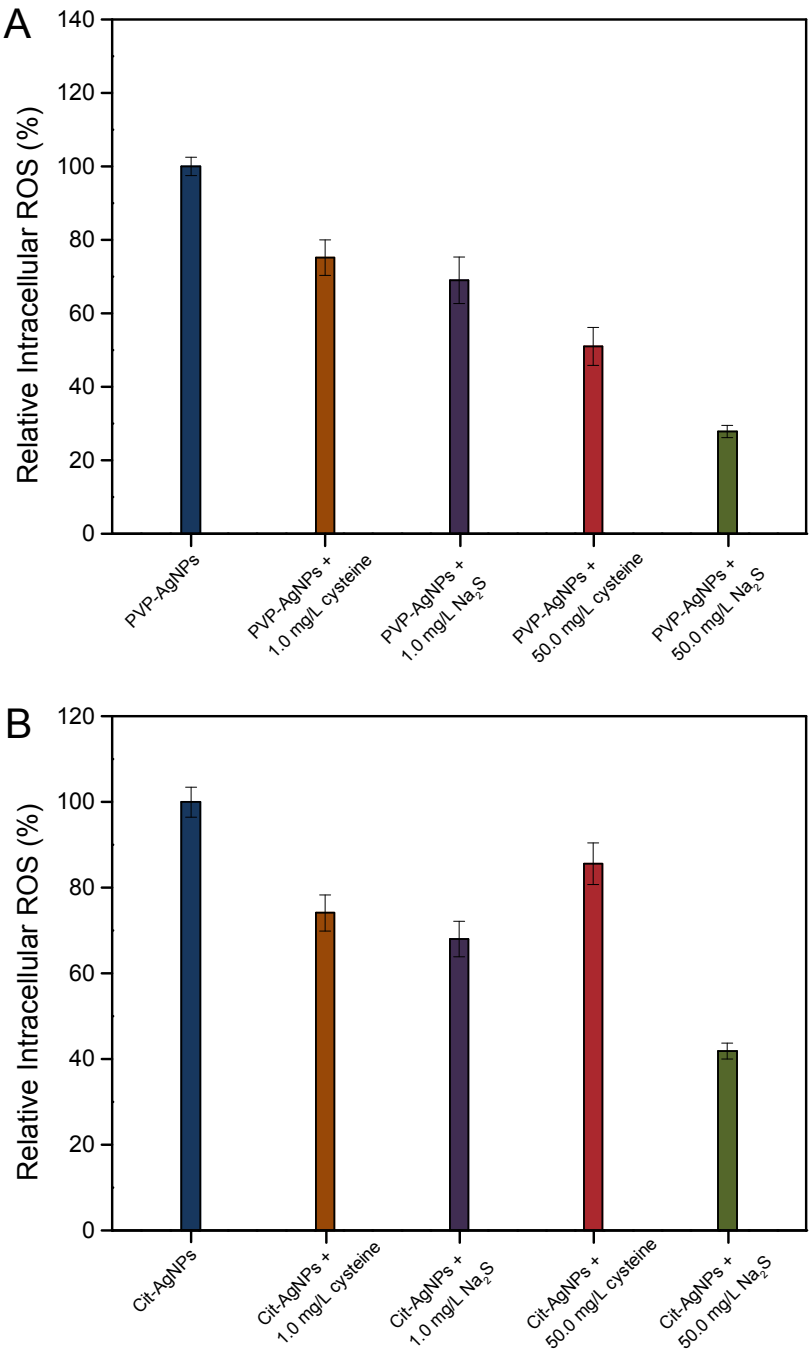

Figure S11. Effect of cysteine (1.0 and 50.0 mg/L) and Na_2S (1.0 and 50.0 mg/L) on the intracellular ROS production. The quantity of pure AgNP induced ROS production was set as 100% as blank sample. The groups of sulfide treatments were a percentage comparing to the blank.