Supporting Information

Sulfidation of silver nanowires inside human alveolar epithelial cells: a potential detoxification mechanism

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Table S1. The crystal structure of silver and various silver compounds based on the Inorganic Crystal Structure Database. Only the main peaks which have intensity ≥ 20 % are listed here.

h	k	l	d (Å)	2Theta (deg)	Intensity (%)
			Ag : Cubic, ICSD ref (01-087-0597)		
1	1	1	2.35917	38.115	100
2	0	0	2.0431	44.299	45.7
2	2	0	1.44469	64.443	22.5
3	1	1	1.23204	77.397	22.2
			Ag_2O : Cubic, ICSD ref (01-041-1104)		
1	1	1	2.7290	32.791	100
2	0	0	2.3620	38.067	28
			AgCl : Cubic, ICSD ref (01-031-1238)		
1	1	1	3.20300	27.831	50
2	0	0	2.77400	32.244	100
2	2	0	1.96200	46.234	50
			Ag_3PO_4 : Cubic, ICSD ref (00-006-0505)		
2	1	0	2.68900	33.293	100
2	1	1	2.45400	36.588	35
3	2	0	1.66760	55.022	20
			Ag_2S: Monoclinic, ICSD ref(00-014-0072)		
-1	1	1	3.437	25.902	35
0	1	2	3.383	26.323	20
1	1	1	3.08	28.967	60
-1	1	2	2.836	31.521	70
1	2	0	2.664	33.614	45
-1	2	1	2.606	34.385	100
0	2	2	2.583	34.701	70
1	1	2	2.456	36.557	70
1	2	1	2.44	36.806	80
0	1	3	2.421	37.105	60
-1	0	3	2.383	37.719	75
0	3	1	2.213	40.74	45
2	0	0	2.083	43.407	45
-1	2	3	1.963	46.209	20

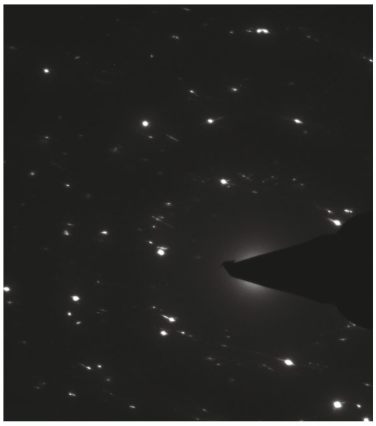

Figure S1. Selected area electron diffraction (SAED) pattern of the as-synthesized AgNWs taken using a selected area aperture size of ~ 550 nm. The interplanar spacings extracted from the SAED patterns were 0.241 ± 0.007, 0.209 ± 0.006, 0.148 ± 0.005 and 0.127 ± 0.004 nm respectively, which is close to bulk Ag (111), (200), (220) and (311) (ref 01-087-0597).

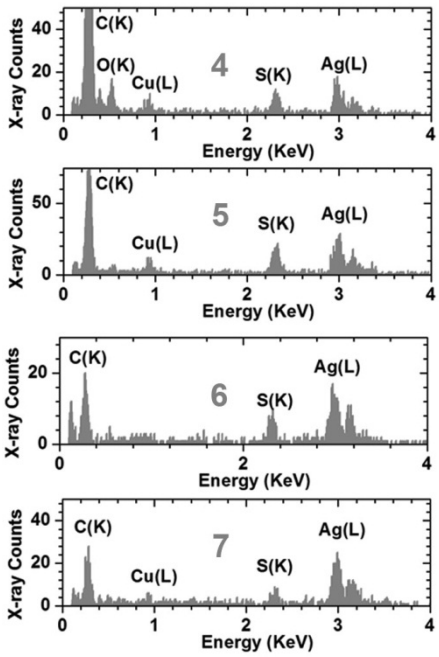

Figure S2. STEM-EDX spectra taken from corresponding areas 4-6 marked in Figure 3e and g. The integrated S(K)/Ag(L) peak ratio extracted from these EDX spectra are presented in Table 1.

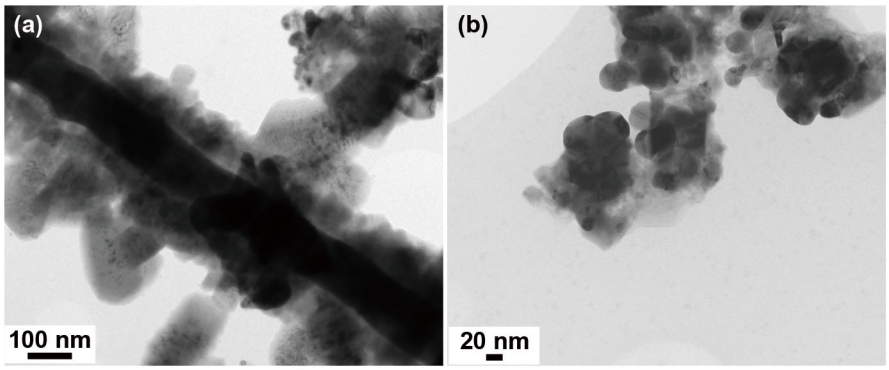

Figure S3. BF-TEM images showing substantial changes in the morphology of AgNWs after incubation with (a) 0.15 % potassium ferricyanide solution (this compound is often used in staining protocols, to reduce osmium tetroxide which enhances its ability to stain biological structures and thus improve the contrast of subcellular organelles), and (b) 1 % osmium tetroxide solution buffered to pH 7.4 with sodium cacodylate, respectively.

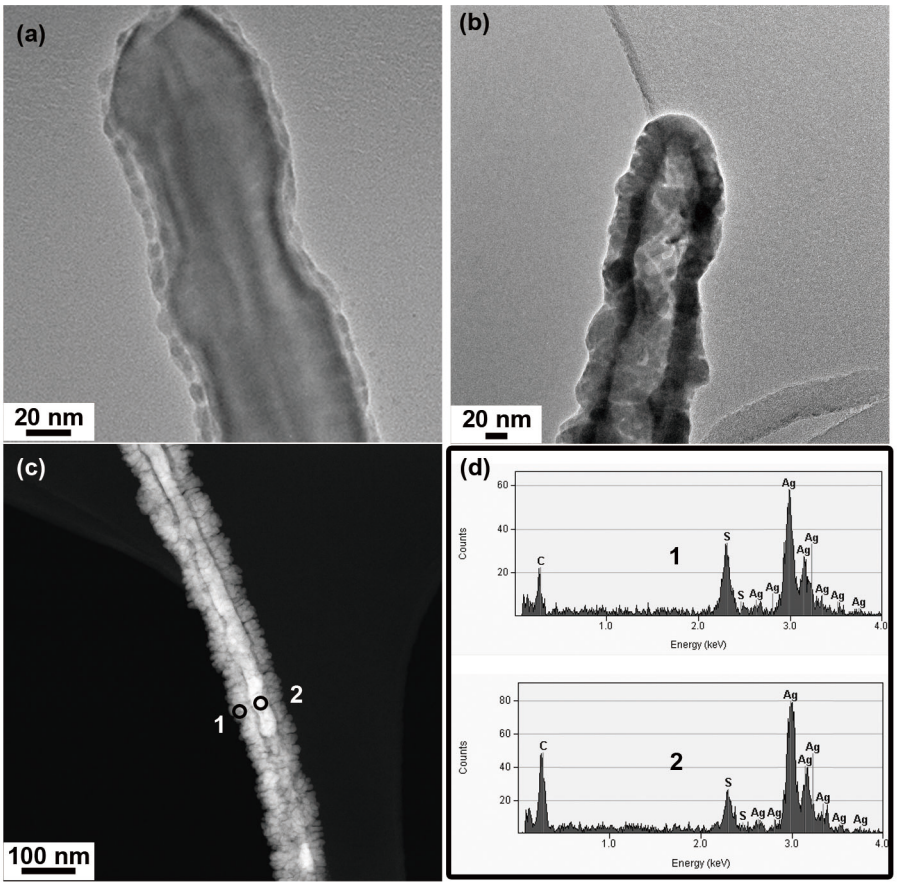

Figure S4. EM characterization of AgNWs deposited on TEM grids left in ambient air as a function of time. (a) BF-TEM image showing particles on the AgNWs surface after 7 days. (b) BF-TEM image showing a hollowed-out AgNW after 2 months exposure to air. (c) HAADF-STEM image of the AgNW sample exposed to air for 2 months. The composition of the outer surface (1) and core (2) were characterized by STEM-EDX analysis. The corresponding EDX spectra taken from regions 1 and 2 in (c) are presented in (d).

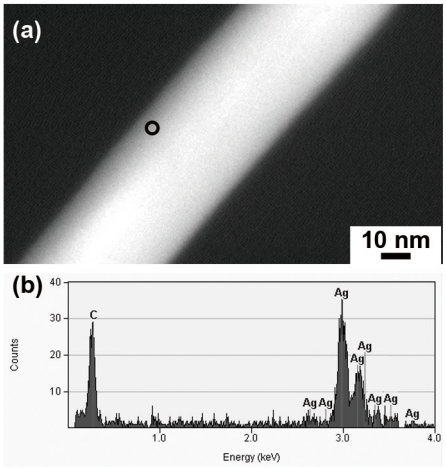

Figure S5. EM characterization illustrates the effect of the embedding procedure on the stability of AgNWs. No heavy metal staining was used. AgNWs were embedded with Quetol and thin sections (70 nm) were taken for TEM imaging and analysis. (a) HAADF-STEM image shows the AgNW and (b) a typical EDX spectrum taken from a region over the AgNW. This analysis demonstrated the embedding and sectioning processes did not alter the morphology or the chemistry of the AgNWs.

Methods

Effect of potassium ferricyanide on AgNWs stability

AgNWs (25 µg/mL) were incubated with 0.15 % potassium ferricyanide water solution for 30 min at room temperature. AgNWs were collected by centrifugation and washed with DI-H_2O (repeated 3 times) before TEM analysis.

Effect of osmium tetroxide on AgNWs stability

AgNWs were incubated with 1% osmium tetroxide buffered to pH 7.4 with 0.1M sodium cacodylate for 30 seconds, rinsed brifly with DI-H_2O and mounted on holey carbon film grids. Extra care should be taken when handling osmium compounds (highly toxic).

Effect of the embedding procedure on AgNWs stability

A 20 µL mixture of AgNWs (25 µg/mL) 1 % Agarose (low gelling temperature, BioReagent, for molecular biology, Sigma) were prepared at 40 °C and allowed to gel at 4 °C. They were subsequently dehydrated and embedded in Quetol without treatment with osmium tetroxide or bulk staining with uranyl acetate as described previously.