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## **Supporting Information**

## **Connecting Concepts of Coinage Metal Stability Across Length Scales**

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**Table S1.** Compilation of data from papers that report Ag(I) ion release as a function of AgNP size. Also shown are calculations of the surface area-normalized Ag(I) ion release, where the Ag(I) ion release is shown in units of mg/m². In many cases, the Ag(I) ion release trends reported in these papers are as a function of AgNP diameter, and the general trend is that as the AgNP diameter decreases, the Ag(I) ion release increases. However, when examining these trends in terms of exposed surface area, some studies find that as the exposed surface area increases, the Ag(I) ion release also increases, but others find that as the exposed surface area increases, the Ag(I) ion release decreases. These discrepancies could be due to factors such as particle aggregation or coalescence as a function of time.

Reference # from main text	Conditions <sup>a</sup>	AgNP diameter (nm)	Initial [Ag] (ppm)	% Ag(I) ion release	[Ag(I)] released (ppm)	Total surface area per liter (m²/L)	Surface area- normalized Ag(I) ion release (mg/m²)
	GA-AgNPs	5.5		51	2.55	0.52	4.93
	O/T/Igiti 5	22.8		5.8	0.29	0.12	2.32
160		4.7	5	62.9	3.15	0.61	5.20
100	PVP-AgNPs	8.4	O	14.5	0.73	0.34	2.14
	1 VI Agivi 3	26.3		6	0.30	0.11	2.77
		38.2		4.1	0.21	0.07	2.75
		4.8	0.05	85	0.043	5.9E-3	7.17
	Acetate	60	0.05	47.4	0.024	4.74E-4	49.99
	buffer, 24 hrs	Foil (4 x 4 x 0.127 mm)	10,700	1.10E-5	1.18E-3	0.02	0.069
186	Aerobic, 120	4.7	c	N/A	2.12	0.24	8.77
100	hrs	10.5	2	N/A	1.25	0.11	11.57
		4	40	69.5	27.8	5.69	4.89
195	28 days	6.1		47	18.8	3.73	5.04
		8.7		21.3	8.52	2.62	3.26
	pH 7.3, 35	4.9	9.8	N/A	2.17	1.14	1.91
197	рп 7.3, 35 days	9.5	10.5	N/A	0.24	0.63	0.37
	uays	19.8	10.4	N/A	0.19	0.30	0.64
		6.2		15	1.19	0.73	1.63
	H-O 90 days	9.2		5.8	0.46	0.49	0.94
	H₂O, 80 days	12.9		3.3	0.26	0.35	0.75
198		70.5	7.92	0.4	0.03	0.06	0.50
190	Acetic acid,	6.2	7.92	41.3	3.27	0.73	4.50
		9.2		20.9	1.65	0.49	3.38
	27-34 days	12.9		13.6	1.08	0.35	3.08
	· ·	70.5		6.9	0.55	0.06	8.55
199 L		11.6		1.3	0.013	0.05	0.27
	UPW, 4 hrs	17.8		1.4	0.014	0.03	0.44
		47.7	1	0.7	7E-3	0.012	0.59
		56.5		0.6	6E-3	0.010	0.60
		94.8		0.6	6E-3	0.006	1.00
200		20	12.7	4.5	0.57	0.36	1.58

AgNPs, 24		BEGM, PVP-						
BEGM,			110		25	0.32	0.07	4 83
BEGM, citrate- AgNPs, 24			110		2.0	0.02	0.07	4.00
Citrate-AgNPs, 24			20		4.3	0.55	0.36	1 51
AgNPs, 24 hrs					110	0.00	0.00	1101
201   Low initial   Low initia			110		22	0.28	0.07	4 25
Low initial   Roy   Ro		_	110		2.2	0.20	0.07	1.20
Middle initial			20	0.2	N/A	0.04	6E-3	7.03
Table   Tabl		[Ag]	80	1	N/A	0.06	7E-3	8.44
Agg	201	Middle initial	20	0.83	N/A	0.15	0.024	6.35
PVP-AgNPs,   6.5   79.1   0.79   0.09   9.04	201	[Ag]	80	2.1	N/A	0.1	0.015	6.70
202   PVP-AgNPs, R2, 115 days   53.4   1   27.7   0.28   0.01   26   26   27.7   0.28   0.01   26   26   27.7   0.28   0.01   26   26   27.7   0.28   0.01   26   26   27.7   0.28   0.01   26   26   27.7   0.28   0.01   26   26   27.7   0.28   0.01   26   26   27.7   0.28   0.01   26   26   27.7   0.28   0.01   26   26   27.7   0.28   0.01   26   26   27.7   0.28   0.01   26   26   27.7   0.28   0.01   26   27.7   0.28   0.01   26   27.7   0.28   0.09   9.79   26   27.7   0.28   0.09   9.79   27.9   28   27.7   0.28   0.07   0.01   6.76   27.7   27.7   0.01   6.76   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7   27.7		High initial	20	1.4	N/A	0.5	0.04	12.55
202         R2, 115 days PVP-AgNPs, lake, 99 days         53.4 PVP-AgNPs, lake, 99 days         1         27.7 0.28 0.01 26 0.09 9.79 0.09 9.79 0.01 6.76 0.00 0.00 0.00 0.00 0.00 0.00 0.00		[Ag]	80	3.4	N/A	0.16	0.024	6.62
PVP-AgNPs, lake, 99 days   53.4		PVP-AgNPs,	6.5		79.1	0.79	0.09	9.04
PVP-AgNPs,   6.5   85.7   0.86   0.09   9.79	202	R2, 115 days	53.4	1	27.7	0.28	0.01	26
Low initial   19.9	202	PVP-AgNPs,	6.5		85.7	0.86	0.09	9.79
204		lake, 99 days	53.4		7.2	0.07	0.01	6.76
204         days         80         N/A         0.03         2.1E-3         14.53           High initial [Ag], 337 days         40 days         0.6         N/A         0.18 0.02 0.20         10.20           206         AgNPs, 24 days         80         N/A         0.12 9E-3 14.29         14.29           206         AgNPs, 24 do hrs         10 7 0.7 0.57         4.17           207         AgNPs, 24 do hrs         10 7 0.7 0.14 4.92         4.92           6.6 0.66 0.66 0.08 8.70         8.70           207         28 hrs         160 5 40.4 2.02 0.018 113.61           208         460 29.2 1.46 6E-3 236.08           208         GA-AgNPs, 5 22 24.5 hrs         22 22 24.5 hrs           208         24.5 hrs         22 3.21 2.7 0.09 0.08 1.04           209         LB, 24 hrs         38 3.1 0.10 0.05 0.23 0.22           209         LB, 24 hrs         19.1 12.5 5.7 0.71 0.37 1.91		Low initial	19.9		N/A	0.12	9E-3	14.22
High initial [Ag], 337 and advs and adv		[Ag], 337	40		N/A	0.07	4.3E-3	15.44
High initial [Ag], 337	204	days	80		N/A	0.03	2.1E-3	14.53
Citrate-   10   23.7   2.37   0.57   4.17	204	High initial	19.9		N/A	0.18	0.02	10.20
Citrate-AgNPs, 24 hrs         10 40 10         23.7 2.37 0.57 0.57 4.17         4.17 4.92 4.92 10.92           207         28 hrs         30 30 460 29.2 1.46 6E-3 236.08         51.5 2.58 0.09 27.15         27.15 2.58 2.58 2.29           208         24.5 hrs         22 7 0.09 0.08 1.04 2.02 2.02         20.018 113.61 2.02 2.02         236.08 2.02 2.02           208         24.5 hrs         22 7 0.09 0.08 1.04 2.02 2.02         20.018 1.04 2.02 2.02         20.018 113.61 2.02           208         24.5 hrs         22 7 0.09 0.08 1.04 2.02 2.02         20.018 1.04 2.02 2.02         20.018 1.04 2.02 2.02           209         LB, 24 hrs         38 3.21 3.21 3.21 7.00 3.21 3.21 3.21 3.21 3.21 3.21 3.21 3.21		[Ag], 337	40	0.6	N/A	0.12	9E-3	14.29
206     AgNPs, 24 hrs     40 hrs     10 7 0.7 0.14 4.92       207     28 hrs     30 51.5 2.58 0.09 27.15       208     28 hrs     160 460 29.2 1.46 6E-3 236.08       208     24.5 hrs     22 7 0.09 0.08 1.04       PVP-AgNPs, 24 hrs     38 38 24 hrs     38 0.21 7 0.09 0.05 0.23 0.22       209     24 hrs     38 1.12 12.5 5.7 0.71 0.37 1.91		days	80		N/A	0.05	4.3E-3	11.53
hrs		Citrate-	10		23.7	2.37	0.57	4.17
207 28 hrs 160 5 40.4 2.02 0.018 113.61 29.2 1.46 6E-3 236.08 6E-3 236.08 24.5 hrs 22 24 hrs 38 24 hrs 38 209 LB, 24 hrs 19.1 12.5 5.7 0.71 0.37 1.91	206	AgNPs, 24	40	10	7	0.7	0.14	4.92
207         28 hrs         160 460         5         40.4 29.2         2.02 1.46         0.018 6E-3         113.61 236.08           208         GA-AgNPs, 24.5 hrs         5 22 PVP-AgNPs, 24 hrs         22 38         26.8 2.7 3.21         0.86 2.7 3.09         0.08 0.05 0.05 0.23 3.1 0.10         1.04 0.05 0.05 0.23 0.22           209         LB, 24 hrs         19.1 12.5         12.5 5.7 0.71         0.71 0.37 0.71         0.37 0.37 0.37         1.91		hrs	75		6.6	0.66	0.08	8.70
208 GA-AgNPs, 5 22 3.21 26.8 0.86 0.37 2.36 24.5 hrs 22 3.21 27 0.09 0.08 1.04 29.2 24 hrs 38 3.21 2.7 0.09 0.08 1.04 2.7 0.05 0.23 0.22 2.7 0.09 0.08 1.04 2.7 0.05 0.23 0.22 2.7 0.09 0.08 1.04 2.7 0.05 0.23 0.22 2.7 0.09 0.08 1.04 2.07 2.07 2.07 2.07 2.09 2.07 2.07 2.09 2.09 2.09 2.09 2.09 2.09 2.09 2.09			30		51.5	2.58	0.09	27.15
208     GA-AgNPs, 24.5 hrs     5 22	207	28 hrs	160	5	40.4	2.02	0.018	113.61
208			460		29.2	1.46	6E-3	236.08
PVP-AgNPs, 24 hrs     8 38     3.21     1.6 0.05 0.23 0.22       209     LB, 24 hrs     38 38     3.1 0.10 0.05 2.07       209     7 0.88 0.78 1.12       209     19.1 12.5 5.7 0.71 0.37 1.91		GA-AgNPs,			26.8	0.86	0.37	2.36
PVP-AgNPs, 24 hrs 38 3.1 0.10 0.05 0.23 0.22 3.1 0.10 0.05 2.07 3.1 0.10 0.05 2.07 3.1 0.10 0.05 2.07 3.1 0.10 0.05 2.07 3.1 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.05 0.23 0.22 3.1 0.10 0.10 0.10 0.10 0.10 0.10 0.10	200	24.5 hrs		2 21	2.7	0.09	0.08	1.04
209 LB, 24 hrs 9.1 7 0.88 0.78 1.12 5.7 0.71 0.37 1.91	200	PVP-AgNPs,	_	3.21				0.22
209 LB, 24 hrs 19.1 12.5 5.7 0.71 0.37 1.91		24 hrs	38		3.1	0.10	0.05	2.07
43.5 4.7 0.59 0.16 3.59	209	LB, 24 hrs	19.1	12.5	5.7	0.71	0.37	
			43.5		4.7	0.59	0.16	3.59

<sup>&</sup>lt;sup>a</sup>Abbreviations: Luria-Bertani broth (LB), gum arabic (GA), polyvinylpyrrolidone (PVP), ultra pure water (UPW), bronchial epithelial cell growth medium (BEGM), river water (R2)

**Table S2.** Compilation of data from papers that report Ag(I) ion release in the presence of additional small molecules in solution. Also shown are estimates of the small molecule: Ag mole ratios and the conclusions reached in these papers about how the small molecules impact Ag(I) ion release. A low molecule: Ag mole ratio does not always lead to increased Ag(I) ion release and vice versa. These discrepancies may be due to variation in the affinities of these molecules for Ag(I) ions or the reduced metal NP surface, or interactions of the molecules with one another, among other possibilities.

Reference # from main text	Initial [Ag]	<b>Molecule</b> <sup>a</sup>	[Molecule] <sup>b</sup>	Molecule:Ag mole ratio (low) <sup>c</sup>	Molecule:Ag mole ratio (high) <sup>c</sup>	Paper conclusion
184	2 mg/L	cysteine, glutathione	0.00005 – 1 mM	0.003	53.5	Decreased release
185	0.35 g/L	cysteine	1 g/L	2.52	N/A	Decreased release
267	5 µM	cysteine	1000, 10,000 nM	0.2	2	Increased release
272	27.8 µM	glutathione	16.7, 83.3, 416.3 μΜ	0.6	15	Increased release
293	171 μg/L	citrate	50 mg C/L	2607	N/A	Decreased release
313	8 μΜ	cysteine	400 μM	50	N/A	Increased release
316	370 μM	glutathione	370 µM	1	N/A	Increased release
317	5 µM	cysteine	0.2, 0.5, 2, 5 μM	0.04	1	Decreased release
318	Not reported	cysteine	0.1, 1, 10 mg/L	Not reported	Not reported	Decreased release
319	1.6 mg/mL	EDTA	0 – 800 mg/L	0.002	0.18	Decreased release
320	500 μg/L	cysteine	0.1 – 10 μM	0.02	2.14	Decreased release

<sup>&</sup>lt;sup>a</sup>Abbreviation: ethylenediaminetetraacetic acid (EDTA)

bln some papers, these concentrations are reported in milligrams of carbon per liter. Where these units were reported, the molecule: Ag calculations done here used the molecular weight of carbon. Where these units were not used or the units were not specified, we assumed that the reported concentrations were in terms of the overall small molecule, so the molecule: Ag calculations were done using the molecular weights of the small molecules.

<sup>c</sup>Where there was more than one concentration of small molecule reported, we evaluate the small molecule:Ag ratio for the lowest and highest small molecule concentrations. Where only one concentration of small molecule was reported, we calculate only one small molecule:Ag ratio.

**Table S3.** Compilation of data from papers that report Ag(I) ion release in the presence of NOM in solution. Also shown are estimations of the NOM:Ag mole ratios and the conclusions reached in these papers about how NOM impacts Ag(I) ion release. Some of these papers seem to observe a trend where a low NOM:Ag mole ratio leads to increased Ag(I) ion release and a high NOM:Ag mole ratio leads to decreased Ag(I) ion release.

Reference # from main text	Initial [Ag]	NOM type <sup>a</sup>	[NOM] <sup>b</sup>	NOM:Ag mole ratio (low) <sup>c</sup>	NOM:Ag mole ratio (high) <sup>c</sup>	Paper conclusion
187	0.05 mg/L	SRHA	5 – 50 mg/L	10.7	107	Decreased release
216	5 mg/L	PLFAd	600 mg/L	9.9	N/A	Decreased release
224	2.8 μg/L	SRDOC	1.46 mg C/L	4649	N/A	Decreased release
224	11.5 μg/L	SRDOC	10.43 mg C/L	8087	N/A	Decreased release
293	171 μg/L	SRFA	300 mg C/L	15,643	N/A	Decreased release
318	Not reported	DOC	10 – 25 mg/L	Not reported	Not reported	Increased release
319	1 mg/mL	alginate	2 – 333 mg C/L	0.018	3	Decreased release
321	5 mg/L	PLFA	1 – 10 mg C/L	0.2	2	Increased release
322	1 mg/L	BSA	600 mg/L	0.97	N/A	Increased release
322	1.6 mg/L	alginate <sup>e</sup>	600 mg/L	0.1	4	Decreased release
323	100 μg/L	PLFA <sup>d</sup>	30 mg/L	24.7	N/A	Increased release
324	1 mg/L	Suwanee River NOM	10 – 80 mg/L	1.07	8.56	Decreased release

<sup>&</sup>lt;sup>a</sup>Abbreviations: Pony Lake fulvic acid (PLFA), bovine serum albumin (BSA), dissolved organic carbon (DOC), Suwannee River humic acid (SRHA), Suwannee River dissolved organic carbon (SRDOC), Suwannee River fulvic acid (SRFA)

bIt is most common for the concentrations of these NOM molecules to be reported in milligrams of carbon per liter. Where these units were reported, the NOM:Ag calculations done here used the molecular weight of carbon. Where these units were not used or the units were not specified, we assumed that the reported concentrations were in terms of the overall NOM species, so the NOM:Ag calculations were done using estimated molecular weights of the NOM species.

<sup>c</sup>Where there was more than one concentration of NOM reported, we evaluate the NOM:Ag ratio for the lowest and highest NOM concentrations. Where only one concentration of NOM was report, we calculate only one NOM:Ag ratio.

<sup>d</sup>PLFA molecular weight ≈ 1300 Da<sup>1</sup>

<sup>e</sup>Alginate molecular weight = 10,000 – 600,000 Da

## References

1. A. Brown, D. M. McKnight, Y.-P. Chin, E. C. Roberts and M. Uhle, Chemical characterization of dissolved organic material in Pony Lake, a saline coastal pond in Antarctica, *Mar. Chem.*, 2004, **89**, 327-337.