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Silver geochemistry and isotope systematics in Ag-rich mine tailings from Namibia

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Electronic Supplementary Material (ESM)

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Table S1. Measured and informative* (or certified) Ag concentrations for the standard reference materials – NIST 2710a (Montana I Soil), 2711a (Montana II Soil) and NIST 2782 (Industrial Sludge) (National Institute of Standards and Technology, USA)

SRM	Measured (mg/kg)	Informative/certified (mg/kg)
NIST 2710a	42.7 ± 5.0	40*
NIST 2711a	5.85 ± 0.28	6*
NIST 2782	33.0 ± 5.2	30.6 ± 4.7

The uncertainties are reported at the 1SD level (n = 2)

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Table S2. Measured and reference Ag isotopic data (expressed as $\delta^{109}Ag$) for the standard reference materials (SRM) – NIST 2710a, 2711a, NIST 2782 and native Ag (Jáchymov, Czech Rep.)

SRM	$\delta^{109}Ag$ (‰)	2SD	Measurements	Dissolutions	Reference
NIST 2710a	+0.542	0.205	2	2	Vaňková et al. (2026)
NIST 2711a	+0.719	0.337	2	2	Vaněk et al. (2023)
NIST 2782	–0.104	0.102	6	6	Vaněk et al. (2023)
NIST 2782	–0.044	0.014	2	1	Luo et al. (2010)
NIST 2782	–0.122	0.073	2	2	Vaňková et al. (2026)
Native Ag	+0.027	0.134	5	3	Vaněk et al. (2023)
Native Ag	–0.143	--	1	1	Mathur et al. (2018); Arribas et al. (2020)

Table S3. Total concentrations of Ag, Pb, Zn, Cd and Fe and Ag isotopic composition (expressed as $\delta^{109}Ag$ relative to standard reference materials (SRM) NIST 978a) in the studied mine tailings and selected ore samples

Profile	Depth (cm)	Ag	Pb	Zn	Cd	Fe (g/kg)	δ109Ag (‰)
		(mg/kg)					
P1	0–10	3.80 ± 0.21	751	7 610	29.3	253	+0.13
	50–60	3.62 ± 0.33	731	5 930	21.8	133	+0.06
	120–130	5.44 ± 0.49	676	15 700	68.9	235	+0.14
	130–140	12.8 ± 1.0	4 440	31 500	151	146	-0.06
	170–180	8.86 ± 0.67	2 240	24 600	112	129	+0.05
	190–200	9.21 ± 0.86	2 960	26 100	120	192	+0.08
	210–220	9.57 ± 0.95	3 000	23 600	114	224	0
	250–260	5.99 ± 0.48	1 670	23 600	116	118	+0.02
	290–300	6.79 ± 0.45	1 820	15 400	101	106	+0.01
P2	0–10	9.26 ± 0.78	2 410	23 900	160	105	+0.06
	40–50	15.1 ± 1.23	3 360	18 600	123	83	+0.26
	80–90	4.41 ± 0.32	953	31 200	105	106	+0.19
	130–140	6.06 ± 0.52	997	26 400	107	107	+0.13
	180–190	16.4 ± 0.5	5 240	28 300	150	71	+0.11
	250–260	9.0 ± 0.8	4 030	13 700	75	97	+0.12
	290–300	16.3 ± 1.2	5 220	32 300	147	99	+0.12
	310–320	14.5 ± 1.2	4 500	29 600	136	96	–0.10
	320–330	9.58 ± 0.84	3 510	20 500	108	112	+0.08
Galena	--	267 ± 20	318 000	1 050	6.26	184	–0.01
Sphalerite	--	41.2 ± 3.8	455	342 000	1270	88	+0.06
Hematite	--	0.84 ± 0.10	80.3	18 500	49.9	365	–0.08
Pyrite	--	3.76 ± 0.42	231	141	0.60	288	+0.02
Pyrrhotite	--	61.5 ± 5.0	8 571	4 810	17.7	365	-0.10

The uncertainties for Ag concentrations are reported at the 1SD level (n = 2); all concentration data represent average values (n = 2) with relative standard deviation (RSD) ≤10%

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Table S4. Water-soluble (Me_{H2O}), exchangeable (Me_{EX}), oxalate-extractable (Me_{OX}) and sulfide-associated (Me_{S}) concentrations of Pb and Zn in the studied mine tailings

Profile	Depth (cm)	Pb_{H2O}	Zn_{H2O}	Pb_{EX}	Zn_{EX}	Pb_{OX}	Zn_{OX}	Pb_{S}	Zn_{S}
		(mg/kg)							
P1	0–10	0.40	1230	1.14	1 060	37.1	1 730	446	6 510
	50–60	0.01	4.96	0.13	301	11.0	1 360	420	4 600
	120–130	0.003	15.8	0.24	186	8.19	426	340	7 340
	130–140	0.02	398	5.62	4 460	65.8	677	3 950	25 400
	170–180	0.002	161	0.43	2 430	26.0	832	1 810	18 600
	190–200	0.004	73.3	2.22	677	60.3	1 120	807	12 600
	210–220	1.43	1 540	8.09	1 200	65.5	2 090	1 220	9 170
	250–260	0.007	376	0.69	2 200	24.9	645	1 370	15 900
	290–300	0.03	296	2.01	1 940	53.7	1 180	2 020	12 600
P2	0–10	0.03	351	3.11	4 720	37.9	1 090	2 920	22 800
	40–50	2.15	1 280	27.0	4 250	20.0	1 070	3 650	14 500
	80–90	0.04	1 130	0.37	4 740	21.7	778	797	33 600
	130–140	0.08	1 070	1.06	1 740	12.3	906	751	25 800
	180–190	9.80	1 140	102	1 520	54.4	1 040	4 190	21 100
	250–260	0.59	513	13.3	1 530	54.2	1 060	4 310	8 720
	290–300	3.56	1 150	57.4	2 460	88.9	1 000	5 000	18 300
	310–320	0.49	58.2	17.7	324	43.8	1 620	5 380	12 900
	320–330	0.13	394	6.05	2 090	34.8	749	3 520	14 600

All concentration data represent average values (n = 2) with relative standard deviation (RSD) ≤10%

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