Appendix A. Supplementary material

Metal(loid)s inhalation bioaccessibility and oxidative potential of particulate matter from chromated copper arsenate (CCA)-contaminated soils

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Number of pages:	*8*
Number of figures:	*2*
Number of tables:	*10*

Table A.1. Physicochemical properties of soil samples

Soil sample	pH	TC (%)	TOC (%)	CEC (meq $100g^{-1}$)
S1	7.80 ± 0.06	7.2 ± 0.1	0.5 ± 0.0	6.2 ± 1.4
S2	7.07 ± 0.07	4.4 ± 0.3	2.8 ± 0.3	24.8 ± 0.9
S3	7.14 ± 0.00	4.8 ± 0.0	2.5 ± 0.3	18.1 ± 1.1
S4	8.02 ± 0.33	4.6 ± 0.1	2.8 ± 0.2	41.4 ± 0.9
S5	7.06 ± 0.09	4.1 ± 0.3	1.6 ± 0.5	20.4 ± 0.3
S6	7.33 ± 0.04	3.1 ± 0.1	0.9 ± 0.1	23.9 ± 0.9
S7	7.32 ± 0.10	3.5 ± 0.3	1.8 ± 0.2	23.6 ± 3.0
S8	6.91 ± 0.06	3.1 ± 0.1	1.1 ± 0.1	33.6 ± 1.8
S9	7.78 ± 0.07	7.5 ± 0.1	1.2 ± 0.0	8.9 ± 1.0
S10	7.83 ± 0.11	7.9 ± 0.1	0.5 ± 0.0	4.2 ± 0.1

Table A.2. Total metal(loid)s concentrations of soil samples collected near CCA-treated wood poles

Soil sample	As (mg kg^{-1})	Cr (mg kg^{-1})	Cu (mg kg^{-1})	Fe (mg kg^{-1})	Mn (mg kg^{-1})	Ni (mg kg^{-1})	Pb (mg kg^{-1})	Zn (mg kg^{-1})
S1	**78 ± 4.7**	45 ± 5.0	103 ± 5.4	9.64E+03 ± 4.2E+02	204 ± 2.2	39 ± 0.6	49 ± 0.4	61 ± 6.2
S2	**190 ± 6.8**	84 ± 0.2	204 ± 3.4	2.32E+04 ± 7.2E+02	456 ± 7.7	32 ± 0.1	86 ± 1.2	388 ± 5.3
S3	**138 ± 2.3**	98 ± 3.6	194 ± 25	2.22E+04 ± 2.9E+03	483 ± 63	30 ± 2.0	33 ± 1.0	120 ± 10
S4	**119 ± 2.0**	117 ± 7.2	199 ± 0.3	3.34E+04 ±1.3E+02	715 ± 9.4	41 ± 0.5	76 ± 5.1	181 ± 0.3
S5	**130 ± 5.9**	54 ± 1.3	155 ± 1.0	1.82E+04 ± 5.4E+02	301 ± 25	34 ± 0.6	46 ± 0.7	70 ± 0.8
S6	**125 ± 11**	80 ± 12	296 ± 30	2.23E+04 ± 3.0E+02	444 ± 4.0	30 ± 1.4	35 ± 2.6	103 ± 3.8
S7	**368 ± 21**	542 ± 2.7	**1190 ± 22**	1.99E+04 ± 8.6E+02	357 ± 6.7	30 ± 1.6	71 ± 0.7	331 ± 1.8
S8	**1372 ± 51**	470 ± 2.1	**1046 ± 18**	2.48E+04 ±1.0E+02	416 ± 6.1	31 ± 0.2	70 ± 0.2	223 ± 5.9
S9	**107 ± 9.5**	105 ± 14	181 ± 16	1.28E+04 ± 2.1E+02	412 ± 38	39 ± 0.7	49 ± 1.3	83 ± 4.5
S10	20 ± 2.4	48 ± 3.6	36 ± 1.5	1.83E+04 ± 6.9E+02	737 ± 2.7	40 ± 0.5	58 ± 1.5	68 ± 0.6
BGS 102	91 ± 1.3	200 ± 20	29 ± 1.0	1.34E+05 ± 8.6E+03	7182 ± 191	95 ± 3.1	93 ± 1.6	199 ± 8.2

Table A.3. Cu fractionation in PM_{20} samples from CCA-contaminated soils

	Total concentration*	Fraction 1		Fraction 2		Fraction 3		Fraction 4		Fraction 5	
	(mg kg^{-1})	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)
P1	588.4 ± 25	9.5 ± 0.0	1.6	89.9 ± 2.3	15.3	308.7 ± 9.5	52.5	97.6 ± 12	16.6	82.8 ± 0.9	14.1
P2	536.3 ± 27	5.3 ± 0.1	1.0	12.9 ± 0.4	2.4	142.2 ± 0.9	26.5	332.4 ± 27	62.0	43.5 ± 1.1	8.1
P3	360.9 ± 8.2	5.0 ± 0.0	1.4	10.1 ± 0.1	2.8	95.2 ± 0.2	26.4	214.6 ± 8.7	59.5	36.1 ± 0.4	10.0
P4	198.7 ± 2.8	2.4 ± 0.0	1.2	5.8 ± 0.0	2.9	59.7 ± 1.4	30.0	85.7 ± 0.4	43.1	45.1 ± 1.0	22.7
P5	416.1 ± 8.0	5.0 ± 0.1	1.2	17.1 ± 0.4	4.1	201.8 ± 1.9	48.5	153.9 ± 5.4	37.0	38.2 ± 0.5	9.2
P6	533.5 ± 15	5.6 ± 0.1	1.0	15.0 ± 0.0	2.8	188.5 ± 1.0	35.3	277.0 ± 16	51.9	47.4 ± 0.5	8.9
P7	4376.7 ± 86	17.4 ± 0.0	0.4	382.9 ± 20	8.7	2779.6 ± 47	63.5	1059.6 ± 64	24.2	137.2 ± 5.4	3.1
P8	2732.1 ± 70	13.9 ± 0.2	0.5	172.9 ± 0.7	6.3	1411.3 ± 93	51.7	990.9 ± 26	36.3	143.1 ± 2.3	5.2
P9	363.0 ± 8.9	6.6 ± 0.3	1.8	53.3 ± 0.6	14.7	155.0 ± 10	42.7	87.5 ± 0.2	24.1	60.7 ± 0.2	16.7
BGS 102	27.7 ± 1.0	0.4 ± 0.1	1.5	0.5 ± 0.1	1.8	2.3 ± 0.0	8.2	2.9 ± 0.1	10.4	21.7 ± 0.7	78.1

*Total metal concentration expressed as sum of all fractions

Table A.4. Ni fractionation in PM_{20} samples from CCA-contaminated soils

	Total concentration*	Fraction 1		Fraction 2		Fraction 3		Fraction 4		Fraction 5	
	(mg kg^{-1})	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)
P1	32.5 ± 0.4	0.4 ± 0.1	1.3	2.8 ± 0.0	8.6	13.2 ± 0.0	40.7	0.7 ± 0.0	2.2	15.3 ± 0.5	47.3
P2	51.7 ± 1.3	1.2 ± 0.0	2.3	3.5 ± 0.2	6.8	12.1 ± 0.1	23.4	6.4 ± 0.2	12.4	28.5 ± 1.0	55.1
P3	43.7 ± 1.8	0.6 ± 0.0	1.4	2.5 ± 0.0	5.8	9.3 ± 0.2	21.2	4.9 ± 0.3	11.3	26.4 ± 2.0	60.4
P4	41.3 ± 0.4	0.5 ± 0.0	1.1	1.6 ± 0.1	3.9	3.0 ± 0.2	7.2	1.2 ± 0.1	2.9	35.1 ± 0.0	84.9
P5	33.7 ± 0.5	0.4 ± 0.0	1.2	2.4 ± 0.1	7.2	9.0 ± 0.4	26.6	1.2 ± 0.1	3.5	20.7 ± 1.0	61.4
P6	36.4 ± 0.0	0.6 ± 0.0	1.6	2.3 ± 0.0	6.3	6.5 ± 0.0	17.8	1.3 ± 0.1	3.6	25.7 ± 0.0	70.6
P7	52.2 ± 0.5	0.5 ± 0.1	1.0	2.4 ± 0.1	4.7	11.8 ± 0.0	22.7	4.2 ± 0.1	8.0	33.2 ± 0.4	63.7
P8	35.0 ± 0.4	1.1 ± 0.0	3.2	1.8 ± 0.1	5.2	9.7 ± 0.0	27.7	2.0 ± 0.1	5.8	20.3 ± 0.5	58.1
P9	30.9 ± 1.6	0.2 ± 0.0	0.5	2.7 ± 0.1	8.7	10.6 ± 0.1	34.3	1.3 ± 0.1	4.3	16.1 ± 1.5	52.2
BGS 102	87.5 ± 0.8	0.3 ± 0.1	0.4	1.6 ± 0.1	1.8	15.9 ± 0.0	18.1	4.0 ± 0.0	4.6	65.7 ± 0.7	75.1

*Total metal concentration expressed as sum of all fractions

Table A.5. Pb fractionation in PM_{20} samples from CCA-contaminated soils

	Total concentration*	Fraction 1		Fraction 2		Fraction 3		Fraction 4		Fraction 5	
	(mg kg^{-1})	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)
P1	60.2 ± 1.9	1.6 ± 0.1	2.6	4.0 ± 0.1	6.6	40.9 ± 2.0	67.9	0.7 ± 0.0	1.2	13.0 ± 0.3	21.7
P2	143.1 ± 6.1	2.5 ± 0.1	1.8	6.8 ± 0.2	4.8	51.5 ± 1.2	36.0	11.0 ± 0.5	7.7	71.3 ± 4.1	49.8
P3	48.9 ± 0.7	2.4 ± 0.0	4.8	4.0 ± 0.1	8.1	11.6 ± 0.1	23.7	2.1 ± 0.1	4.2	28.9 ± 0.4	59.1
P4	78.2 ± 1.2	2.1 ± 0.1	2.7	4.0 ± 0.1	5.2	19.2 ± 0.0	24.5	10.4 ± 0.5	13.3	42.5 ± 0.5	54.4
P5	64.5 ± 3.0	1.7 ± 0.2	2.7	4.7 ± 0.1	7.2	27.1 ± 1.2	42.0	2.8 ± 0.4	4.3	28.2 ± 1.5	43.7
P6	52.4 ± 1.4	2.6 ± 0.1	4.9	4.3 ± 0.1	8.3	11.6 ± 0.4	22.2	2.5 ± 1.0	4.8	31.4 ± 0.0	59.9
P7	122.2 ± 0.7	2.1 ± 0.1	1.7	5.4 ± 0.0	4.4	39.6 ± 1.4	32.4	10.1 ± 0.1	8.2	65.0 ± 2.2	53.2
P8	133.3 ± 2.8	3.0 ± 0.0	2.2	4.9 ± 0.0	3.7	34.1 ± 2.2	25.6	18.6 ± 1.6	14.0	72.7 ± 1.1	54.5
P9	66.4 ± 1.1	1.5 ± 0.0	2.2	4.6 ± 0.0	6.9	44.8 ± 1.0	67.4	1.0 ± 0.3	1.6	14.6 ± 0.3	22.0
BGS 102	101.9 ± 16	1.3 ± 0.3	1.3	2.4 ± 0.2	2.3	27.4 ± 8.1	26.9	12.3 ± 3.0	12.0	58.5 ± 4.8	57.4

*Total metal concentration expressed as sum of all fractions

Table A.6. Zn fractionation in PM_{20} samples from CCA-contaminated soils

	Total concentration*	Fraction 1		Fraction 2		Fraction 3		Fraction 4		Fraction 5	
	(mg kg^{-1})	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)	(mg kg^{-1})	(%)
P1	190.3 ± 1.4	1.6 ± 0.0	0.8	41.0 ± 1.7	21.6	109.0 ± 2.3	57.3	2.6 ± 0.2	1.4	36.1 ± 0.6	18.9
P2	1023.5 ± 60	13.5 ± 1.3	1.3	141.7 ± 1.3	13.8	719.2 ± 70	70.3	68.6 ± 0.2	6.7	80.5 ± 7.2	7.9
P3	260.5 ± 2.1	3.9 ± 0.2	1.5	34.4 ± 0.6	13.2	135.7 ± 4.6	52.1	21.2 ± 0.6	8.1	65.3 ± 6.4	25.1
P4	199.1 ± 4.2	1.2 ± 0.1	0.6	7.2 ± 0.6	3.6	62.2 ± 2.2	31.2	13.7 ± 0.8	6.9	114.9 ± 0.5	57.7
P5	81.6 ± 1.0	0.3 ± 0.0	0.4	1.3 ± 0.1	1.6	19.1 ± 1.6	23.4	3.5 ± 0.1	4.2	57.5 ± 2.5	70.4
P6	144.0 ± 0.6	1.0 ± 0.0	0.7	6.3 ± 0.1	4.4	56.2 ± 1.8	39.1	7.3 ± 0.2	5.1	73.1 ± 1.6	50.8
P7	1083.4 ± 78	10.4 ± 0.1	1.0	202.1 ± 6.5	18.7	725.9 ± 75	67.0	51.8 ± 2.8	4.8	93.2 ± 0.3	8.6
P8	583.8 ± 20	5.1 ± 0.2	0.9	77.2 ± 0.4	13.2	371.5 ± 22	63.6	29.3 ± 4.2	5.0	100.6 ± 1.9	17.2
P9	128.3 ± 0.5	0.9 ± 0.0	0.7	18.5 ± 1.2	14.5	71.1 ± 0.3	55.5	3.0 ± 0.6	2.4	34.6 ± 0.4	27.0
BGS 102	179.2 ± 1.5	0.5 ± 0.0	0.3	3.1 ± 0.0	1.7	47.8 ± 1.6	26.7	5.0 ± 0.5	2.8	122.8 ± 0.5	68.5

*Total metal concentration expressed as sum of all fractions

Table A.7. Inhalation bioaccessibility of metal(loid)s in GS (mg kg^{-1})

	As	Cr	Cu	Fe	Mn	Ni	Pb	Zn
P1	60.6 ± 1.2	6.0 ± 1.4	45.0 ± 5.8	8.0 ± 1.4	12.0 ± 0.8	<DL*	1.0 ± 0.0	0.5 ± 0.7
P2	69.0 ± 0.4	5.0 ± 1.4	17.0 ± 0.0	17.5 ± 0.7	12.5 ± 0.0	<DL	1.5 ± 0.7	3.0 ± 0.0
P3	30.4 ± 0.4	3.0 ± 0.0	10.9 ± 0.0	11.9 ± 0.0	8.5 ± 0.0	<DL	1.0 ± 0.0	0.5 ± 0.7
P4	18.2 ± 0.2	2.0 ± 0.0	3.0 ± 0.0	8.0 ± 0.1	3.0 ± 0.7	<DL	1.0 ± 0.0	<DL
P5	55.5 ± 2.1	3.0 ± 0.0	17.5 ± 0.7	12.5 ± 0.7	5.5 ± 1.4	<DL	0.7 ± 0.4	0.5 ± 0.7
P6	64.1 ± 0.5	1.5 ± 0.7	15.0 ± 0.1	6.0 ± 0.0	13.5 ± 1.5	<DL	<DL	0.5 ± 0.7
P7	166.7 ± 6.7	6.0 ± 0.0	169.5 ± 1.7	1.0 ± 0.0	5.5 ± 2.1	<DL	<DL	0.5 ± 0.7
P8	521.2 ± 26	4.5 ± 0.7	62.7 ± 0.4	2.0 ± 0.0	12.9 ± 0.1	<DL	<DL	<DL
P9	34.2 ± 1.0	0.2 ± 0.0	15.5 ± 0.7	2.5 ± 0.7	7.0 ± 1.4	<DL	<DL	<DL
P10	10.0 ± 0.3	0.6 ± 0.6	5.5 ± 0.7	1.5 ± 0.7	1.5 ± 0.7	<DL	0.7 ± 0.3	<DL
BGS 102	2.4 ± 0.1	1.0 ± 0.0	0.6 ± 0.6	14.0 ± 11	22.0 ± 0.7	<DL	0.7 ± 0.4	<DL

*Below DL for both replicates. A value of DL/2 was used in Fig 2. to calculate bioaccessibility percentages

Table A.8. Inhalation bioaccessibility of metal(loid)s in GS (%)

	As	Cr	Cu	Fe	Mn	Ni	Pb	Zn
P1	13.9	3.6	6.9	< 0.1	3.9	< 0.2	1.9	0.3
P2	8.1	0.8	3.7	0.1	2.1	< 0.2	0.9	0.4
P3	7.5	0.9	2.7	< 0.1	1.4	< 0.2	2.1	0.2
P4	10.9	0.9	1.6	< 0.1	0.4	< 0.2	1.1	< 0.1
P5	16.3	2.5	3.9	< 0.1	1.5	< 0.2	1.2	0.7
P6	22.2	1.1	2.9	< 0.1	2.0	< 0.2	< 1.0	0.3
P7	6.6	0.2	4.5	< 0.1	0.9	< 0.2	< 1.0	< 0.1
P8	8.9	0.2	2.2	< 0.1	2.4	< 0.2	< 1.0	< 0.1
P9	9.5	0.1	3.9	< 0.1	1.8	< 0.2	< 1.0	< 0.1
P10	17.0	0.9	3.7	< 0.1	0.2	< 0.2	1.1	< 0.1
BGS 102	2.3	0.4	2.2	< 0.1	0.3	< 0.2	< 1.0	< 0.1

Table A.9. Inhalation bioaccessibility of metal(loid)s in ALF (mg kg^{-1})

	As	Cr	Cu	Fe	Mn	Ni	Pb	Zn
P1	212.9 ± 1.0	62.6 ± 6.8	525.4 ± 20	2714.6 ± 75	219.2 ± 1.3	12.5 ± 0.6	13.5 ± 0.6	152.1 ± 9.6
P2	366.4 ± 4.1	149.7 ± 11	373.8 ± 0.1	4403.2 ± 19	281.9 ± 2.7	19.0 ± 0.0	77.8 ± 0.2	756.5 ± 16
P3	135.6 ± 3.1	63.4 ± 7.9	296.4 ± 13	4632.8 ± 77	278.9 ± 9.6	12.0 ± 0.0	19.5 ± 0.7	181.6 ± 7.5
P4	59.8 ± 2.3	52.6 ± 5.1	136.3 ± 10	3754.1 ± 85	287.0 ± 0.1	5.0 ± 0.0	29.6 ± 0.7	50.6 ± 1.5
P5	205.7 ± 2.5	66.5 ± 4.4	351.0 ± 0.1	5602.2 ± 44	177.5 ± 2.1	16.5 ± 0.6	41.0 ± 1.1	17.0 ± 0.6
P6	246.2 ± 0.8	103.7 ± 0.8	444.3 ± 1.3	6829.7 ± 172	401.9 ± 2.6	8.5 ± 0.6	21.4 ± 0.9	61.3 ± 0.5
P7	873.6 ± 5.8	953.6 ± 39	3039.9 ± 22	5873.1 ± 188	307.8 ± 5.5	8.8 ± 0.5	49.7 ± 0.6	793.9 ± 17
P8	2950.2 ± 8.2	732.3 ± 32	2328.7 ± 4	14260.1 ± 583	332.0 ± 2.6	9.4 ± 0.7	58.9 ± 4.0	381.9 ± 11
P9	146.8 ± 0.3	53.4 ± 0.7	295.2 ± 1.5	1852.9 ± 21	241.8 ± 2.0	7.2 ± 0.5	8.0 ± 0.1	73.8 ± 0.7
P10	32.7 ± 0.4	21.0 ± 4.1	113.7 ± 0.0	4797.1 ± 177	573.7 ± 13	17.4 ± 0.7	28.4 ± 0.9	31.4 ± 0.1
BGS 102	11.2 ± 0.4	42.3 ± 1.9	7.0 ± 0.0	5844.0 ± 213	5443.3 ± 56	22.9 ± 0.1	31.4 ± 2.2	48.8 ± 0.9

Table A.10. Inhalation bioaccessibility of metal(loid)s in ALF (%)

	As	Cr	Cu	Fe	Mn	Ni	Pb	Zn
P1	48.9	37.7	80.8	14.9	71.9	25.6	26.0	73.5
P2	43.3	22.5	82.2	14.8	47.4	35.1	45.9	90.9
P3	33.5	19.6	73.8	14.0	45.6	22.5	41.3	70.2
P4	35.9	23.1	72.4	9.7	41.7	11.3	33.2	24.6
P5	60.4	54.8	78.3	20.9	48.0	38.4	65.0	21.6
P6	85.4	73.0	85.9	25.5	61.0	20.4	44.1	38.4
P7	34.4	25.0	80.1	15.5	49.6	14.4	35.7	75.0
P8	50.4	26.1	80.1	37.7	62.1	20.1	33.9	68.2
P9	40.8	31.6	74.2	10.7	62.9	14.5	12.2	56.5
P10	55.6	32.3	76.6	25.1	77.8	25.5	40.3	29.3
BGS 102	10.8	18.8	26.8	4.4	74.3	28.6	39.5	25.6

Figure A.1. SEP metal recovery in PM_{20} samples from CCA-contaminated soils (avg. ± SD, n=10)

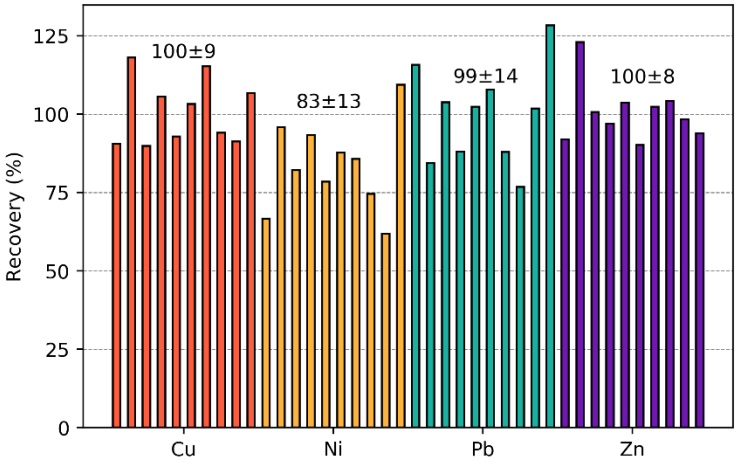

Figure A.2. Metal(loid)s spiking recovery in SLFs