Table S1: The quality control of the ICP-MS measurements was verified using the certified reference material SRM-1648a.

	SRM-1648a	ICP-MS	Recovery (%)
Potentially Toxic elements (mg kg^{-1})			
V	127	127.54	100
Cr	402	376.28	94
Mn	790	802.87	102
Co	17.93	17.24	96
Ni	81.1	78.57	97
Cu	610	572.16	94
As	115.5	97.85	85
Cd	73.7	70.69	96
Sb	45.4	44.10	97
Pb	6550	6494.13	99

Table S2: Chemical composition of ALF solutions used for *in vitro* lung bioaccessibility test (Meza-Figueroa et al, 2020).

*Reagent required for 1 L of solution (g)	Formula	ALF (pH~4.5)
Magnesium chloride hexahydrate	$MgCl_2 \cdot 6H_2O$	0.05
Sodium chloride	NaCl	3.21
Disodium hydrogen phosphate	Na_2HPO_4	0.07
Sodium sulphate	Na_2SO_4	0.04
Calcium chloride dihydrate	$CaCl_2 \cdot 2H_2O$	0.13
Sodium citrate dihydrate	$C_6H_5Na_3O_7 \cdot 2H_2O$	0.08
Sodium hydroxide	NaOH	6
Citric acid	$C_6H_8O_7$	20.8
Glycine	H_2NCH_2COOH	0.06
Sodium tartrate dihydrate	$C_4H_4O_6Na_2 \cdot 2H_2O$	0.09
Sodium lactate	$C_2H_5NaO_3$	0.09
Sodium pyruvate	$C_3H_3O_3Na$	0.09

*Reagent purity ~99.8%.

Table S3: Parameters and values for human health risk calculation (USEPA, 2001 and 2002).

Factor	Unit	Definition	Value	
			Children	Adults
ADD	mg kg^{-1} day^{-1}	Average daily dose through ingestion, inhalation, and dermal contact	-	-
C	mg kg^{-1}	Concentration of metal(oid)	-	-
IngR	mg day^{-1}	Ingestion rate	200	100
InhR	m^3 day^{-1}	Inhalation rate	7.6	20
EF	days $year^{-1}$	Exposure frequency	350	350
ED	years	Exposure duration	6	24
BW	kg	Body weight	10	55
AT_{nc}	days	Average time (for non-carcinogens)	365×ED	365×ED
AT_c	days	Average time (for carcinogens)	365×70	365×70
CF	kg mg^{-1}	Conversion factor	1×10^{-6}	1×10^{-6}
SA	cm^2	Surface skin area available for exposure	2800	5700
AF	mg cm^{-2} day^{-1}	Skin adherence factor	0.2	0.07
ABF	-	Dermal adsorption factor	0.001	0.001
PEF	m^3 kg^{-1}	Particle emission factor	1.36×10^9	1.36×10^9

Table S4: Reference dose (RfD, mg kg^{-1} day^{-1}) values for non-carcinogenic risk and slope factor (SF, kg mg^{-1} day^{-1}) values for carcinogenic risk (USEPA, 2002; USEPA, 2010; Schiavo et al., 2024 and 2026).

Potentially Toxic Elements	**RfD**			**SF**		
	Ingestion	Inhalation	Dermal contact	Ingestion	Inhalation	Dermal contact
V	9.0E-03	2.0E-04	9.0E-03	-	-	-
Cr	3.0E-03	2.7E-05	1.9E-02	5.0E-01	4.1E+01	-
Mn	2.4E-02	5.0E-05	9.6E-04	-	-	-
Co	3.0E-04	6.0E-05	9.0E-05	-	-	-
Ni	2.0E-02	5.4E-03	2.0E-02	-	8.4E-01	-
Cu	4.0E-02	1.2E-02	4.0E-02	-	-	-
As	3.0E-04	5.0E-04	1.2E-04	1.5E+00	1.5E+01	3.7E+00
Cd	1.0E-03	1.0E-05	2.5E-05	-	6.3E+00	-
Sb	4.0E-04	2.0E-05	8.0E-05	-	-	-
Pb	1.4E-03	3.5E-03	1.4E-03	8.5E-03	4.2E-02	-

Table S5: Wilcoxon signed-rank test comparing PTE concentrations in road dust between the dry and wet seasons at the same sampling locations (n = 37). Significant seasonal differences are indicated by $p < 0.05$.

PTE	**p-value**	**Effect size**	**Interpretation**
V	0.012	0.44	Moderate
Cr	0.56	0.10	Negligible
Mn	0.86	0.03	Negligible
Co	0.014	0.43	Moderate
Ni	0.75	0.06	Negligible
Cu	0.55	0.10	Negligible

As	0.16	0.29	Small
Cd	0.81	0.04	Negligible
Sb	0.21	0.22	Small
Pb	0.008	0.46	Moderate

Table S6: Potentially Toxic Element (PTE) concentrations (mg kg^{-1}) in the <20 µm fraction of road dust collected during the dry and wet sampling seasons in Mexico City.

	V	Cr	Mn	Co	Ni	Cu	As	Cd	Sb	Pb
Dry season										
S1	119.8	250.3	975.8	13.7	53.1	198.7	<LD	0.8	12.3	86.1
S2	215.1	269.6	1518.1	20.12	117.8	360.7	<LD	2.5	19.5	251.8
S3	136.9	165.8	955.7	12.7	53.5	80.4	5.9	0.6	4.8	99.9
S4	99.2	114	776.8	9.9	41.3	118.9	2.9	0.7	5.9	105.8
S5	152	190.6	1073.3	15.4	67	130.2	4.7	0.7	6.6	139.7
S6	113.9	153.3	903.2	12.5	54.3	158	0.7	0.9	6.5	121.7
S7	125	211.4	958.6	13.1	54.2	94.7	<LD	0.5	6	120.7
S8	141.6	227.5	1170.8	15.4	61.9	95.7	0.6	0.4	4.5	106.9
S9	145.6	226.7	1115.5	14.4	59.3	117.1	0.4	0.5	5.7	160.4
S10	101.4	98.6	802.3	10	35.7	35.2	<LD	0.3	2.7	58.7
S11	138.1	176.6	1086.8	13.4	58.7	112.7	<LD	0.9	5.7	60.7
S12	176.4	210.6	855.6	14	50.6	107.8	<LD	0.4	6.9	78.8
S13	145	308	871.1	20.4	87.1	417.3	<LD	1.7	13.6	333.7
S14	99.3	121.4	731.5	11.7	47.8	86	<LD	0.6	4.7	113.8
S15	108.8	138.1	821.4	16	57.2	109.4	4.5	0.8	6.4	111.9
S16	173.8	231.3	1002.3	15.1	64.8	225.1	9.6	1.3	6.6	121.8
S17	120.3	183.5	825.2	12.1	54.7	303.5	<LD	0.7	17	143.8
S18	116	150.1	850.3	11.2	50.2	220.8	<LD	0.6	6.4	134.8
S19	109.6	111.1	618.2	10.2	44.5	169	5.3	0.5	6.1	96.2
S20	117.9	132.3	722.6	10.8	44.9	137.2	1.3	0.6	7.8	120.1
S21	112.4	132.8	720.7	10.7	43.2	135.7	4.4	0.5	7.4	107.3
S22	98.1	116.2	701.7	9.5	38.1	102.2	10.8	0.6	7.4	116.7
S23	112.5	132.8	755.8	10.3	55.4	192.1	57.6	0.8	12.5	144.5
S24	89.5	128.2	661.1	9.5	38.4	91.8	10.4	0.6	7.8	110.2
S25	95	131.9	554.7	9.5	32.1	129.5	<LD	0.8	7.6	142.3
S26	140.4	193.4	851	14.8	61.8	181.9	2.2	1.6	5	96.6
S27	97.6	125.7	684.2	10.3	31.6	131.9	3.6	1.1	4.6	123.4
S28	148.5	239.4	908.5	14.9	53.6	248.3	5.9	1.2	11.4	528.9
S29	115	220.8	704.2	13.2	39.7	96.5	0.6	0.7	4.3	188.7
S30	107.8	146.1	701	11	53.1	148.3	3.6	0.8	5.2	143.2
S31	112.4	143.5	613.1	11.5	32.6	88.5	4.4	0.8	4.68	116.1
S32	138.8	411.7	800.7	14.1	53.2	392.2	10.8	0.8	10.6	113.7
S33	109.9	151.7	667.4	12.1	40	173.8	12	0.8	6.1	88.1
S34	142.6	216.3	808.6	12.5	45.2	172.3	10.1	4.8	9.8	115.6
S35	157	205.6	873	16.5	48.5	173.8	10.2	1.1	7.5	127.1
S36	160.6	182.9	822.8	14.8	44.5	79.8	18.5	0.7	3.2	69.1
S37	132.4	254.1	857.8	15.4	55	119.9	13	0.6	7.8	95.6
Wet season										
S1	155.6	205.9	881.9	16.9	51.1	183	8.3	0.7	8.2	115.4
S2	170	200.2	1046.9	16.7	57.8	148.8	16.1	0.8	6	150.1
S3	107.2	130.7	615.6	10.2	34.5	65.7	6.6	0.6	4.1	112.5
S4	138.8	184.1	826.5	14	47.9	93	10.8	0.9	5.2	214.3
S5	269.2	358.4	1658.1	37	145.8	174	19	0.7	7.1	231.8

S6	125.9	130	781.5	12.4	38.5	90.3	14.3	1.4	4.7	139.6
S7	147	236.5	858.2	15.2	48.8	86.1	5.7	0.6	4.5	199.6
S8	152	223.2	900.4	16	51.3	75.1	9.9	0.5	4.2	141
S9	126.8	188	738.5	13.7	40.4	65.6	4	0.4	3	156.8
S10	122.9	115.7	711.2	11.2	31.1	55.8	7.6	0.4	2.1	86.8
S11	181.7	168.8	862.7	14.1	32.1	69	14	0.3	3.4	141.5
S12	161.4	161	847.9	14.3	43.4	66.1	2	0.4	3.4	51.1
S13	117.7	189.8	763.6	12.2	42	102.2	0.1	0.8	3.5	140.2
S14	126.3	131.6	683.8	12.6	38.5	64.1	10.8	0.4	2.1	108.5
S15	163.7	220.1	984.7	17	61.1	108.1	11.9	0.6	6.3	152.6
S16	113.7	143.1	644.3	11.4	38.2	128.4	7.9	0.6	5.8	105.5
S17	127.9	199.2	782.3	12.6	44.1	209	8.7	0.6	20.1	147.3
S18	129	169.7	699.8	13.1	45.8	146.5	3.3	4	10.2	263.8
S19	171.7	224.8	908.6	16.6	64.8	229.1	11.8	0.7	8.4	192
S20	129.1	117.3	685.7	11.4	32.1	105.9	10.7	0.6	8.2	114.7
S21	116.5	141.1	675.6	11.9	41	165.5	8.6	1.7	12	214.6
S22	132.4	203	767.1	14.2	53	118.7	25.3	0.7	7.2	163.3
S23	164.6	243.2	1024.3	20.9	106.8	281.5	141.9	0.7	13.2	168.9
S24	111.3	152.2	689.7	11.6	38.6	91.8	3.7	0.6	5.9	137.9
S25	126.9	184.5	807.3	13.9	49	184.3	5.5	0.6	6.9	123
S26	114.8	124.4	776.9	12.1	42.2	109.7	12.2	1	4.4	166.8
S27	123.4	159.6	768.5	13	47.1	155.7	17.2	1.3	5.7	171.6
S28	185.7	289.4	1030.5	26.1	93.1	230.7	5.2	0.6	6.6	668.2
S29	111.6	161.9	687.9	13.2	46.9	142.2	11.1	1.2	3.8	162.3
S30	141.3	216.7	871.2	21.2	96.9	218	7.2	1.1	6.6	200.3
S31	138.5	168.3	763.6	14	47.3	98.7	4.5	0.6	4.6	136.8
S32	222.8	397.8	1151.8	27.9	108.5	456	8.8	1	12.2	150.5
S33	123.6	159.9	738.5	12.9	42.6	138.7	11.9	3.8	5.3	179.8
S34	113.6	156.7	635.5	10.9	36.4	54.3	1.3	1	3.1	105.5
S35	174.4	235.7	971.6	17.4	56	170.2	9.8	0.8	5.8	238.6
S36	159.8	165.3	806	14	45.8	77.3	10.9	0.4	2.2	46.5
S37	166	265.6	997.6	25.9	63.9	116	19	0.7	7.4	127.3

Table S7: Lung bioaccessibility (%) of PTEs from Mexico City road dust during dry and wet season.

	V	Cr	Mn	Co	Ni	Cu	As	Cd	Sb	Pb
Dry season										
S1	1.1	1	2.6	4.2	6.1	7.9	<LOD	<LOD	<LOD	7.1
S5	0.8	1.2	2.3	3.6	3.1	6.9	<LOD	<LOD	<LOD	6.2
S6	1.1	1.5	2.9	4.1	2.8	6.9	<LOD	<LOD	<LOD	7.2
S8	0.8	1.1	2.1	3.1	3.2	7.3	<LOD	<LOD	<LOD	8.1
S12	0.9	1.4	3.1	3.8	4	7.1	<LOD	<LOD	<LOD	7.8
S14	1.7	29.9	4.3	9.9	37.9	11.7	<LOD	<LOD	<LOD	8.5
S17	1.4	21.7	4.7	11.4	55.7	15.3	<LOD	<LOD	<LOD	8.1
S19	1.7	3.9	3.9	6.3	38.9	24.5	12.9	<LOD	<LOD	7.4
S20	1.2	11.7	4.5	7.7	38.6	15	<LOD	<LOD	<LOD	10.2
S23	1.3	7.3	3.9	6.9	30.7	23.5	2.1	<LOD	<LOD	10.3
S28	1.1	4	4.1	6.4	20	10.2	<LOD	<LOD	<LOD	8.9
S29	1.5	5.3	4.3	7.1	26.9	17.9	31.8	<LOD	<LOD	6
S32	1.1	11	4.1	8.7	51.6	9.1	<LOD	<LOD	<LOD	5.9
S35	1	19.8	4	8.6	53.9	10.8	<LOD	<LOD	<LOD	6.6
S36	2	3	3.2	7.8	100*	100*	9.3	<LOD	<LOD	5.2

Wet season										
S1	1.3	14	4.1	12.9	44.6	16.9	<LOD	<LOD	<LOD	6.4
S5	0.4	3.7	2	3.4	18.8	22.7	2.3	<LOD	<LOD	4.7
S6	1.2	10.9	4.3	7.5	36.2	12.9	2.8	<LOD	<LOD	6.7
S8	0.8	7.6	3.1	5.3	26.7	14.9	3.7	<LOD	<LOD	5.9
S12	0.7	16.7	3.7	8.4	61.6	24.1	<LOD	<LOD	<LOD	6.4
S14	1	5.6	4.4	9.4	100*	100*	15.5	<LOD	<LOD	5.5
S17	1.3	28	4.5	10.7	74.1	9.9	<LOD	<LOD	<LOD	5.8
S19	0.6	6.1	2.1	3.9	15.6	9.4	<LOD	<LOD	<LOD	6.5
S20	1.1	6.3	4.1	6.1	19.6	11.8	<LOD	<LOD	<LOD	10
S23	0.6	2.7	2.2	2.5	7.6	7.4	1.1	<LOD	<LOD	4.5
S28	0.6	4.5	2.9	4	23.8	10.9	<LOD	<LOD	<LOD	6.7
S29	1.1	0.9	3.5	2.7	5.4	6.6	<LOD	<LOD	<LOD	5.1
S32	0.4	0.4	2	2.1	1.8	5.5	<LOD	<LOD	<LOD	7.1
S35	0.8	0.7	2.5	3	<LOD	5.4	<LOD	<LOD	<LOD	5.8
S36	1.6	<LOD	2.3	3.2	<LOD	5	<LOD	<LOD	<LOD	5.1

*Values exceeding 100% bioaccessibility were reported as 100%.

Table S8: Bioaccessibility-adjusted inhalation hazard quotients ($HQ_{inh\text{-}adj}$) calculated using ALF-extractable concentrations of PTEs in road dust from Mexico City for adults and children during the dry and wet seasons.

	V	Cr	Mn	Co	Ni	Cu	As	Cd	Sb	Pb
Dry season										
Adults	2.06E-08	1.46E-06	1.52E-06	3.72E-08	7.59E-09	5.81E-09	5.26E-09	-	-	8.34E-09
Children	2.30E-08	2.04E-06	2.11E-06	5.19E-08	1.06E-08	8.09E-09	7.32E-09	-	-	1.16E-08
Wet season										
Adults	1.74E-08	1.42E-06	1.43E-06	3.93E-08	9.45E-09	4.81E-09	4.63E-09	-	-	8.09E-09
Children	2.42E-08	1.98E-06	1.99E-06	5.48E-08	1.32E-08	6.70E-09	6.44E-09	-	-	1.13E-08

Figure S1: Percentage of sampling sites in Mexico City road dust exceeding the local background concentration for each PTE during the dry season (blue bars) and wet season (orange bars). Values above the bars indicate the proportion (%) of sites with concentrations higher than the background reference, emphasizing the widespread enrichment of Cu, Sb, Pb, and Cd in both seasons.

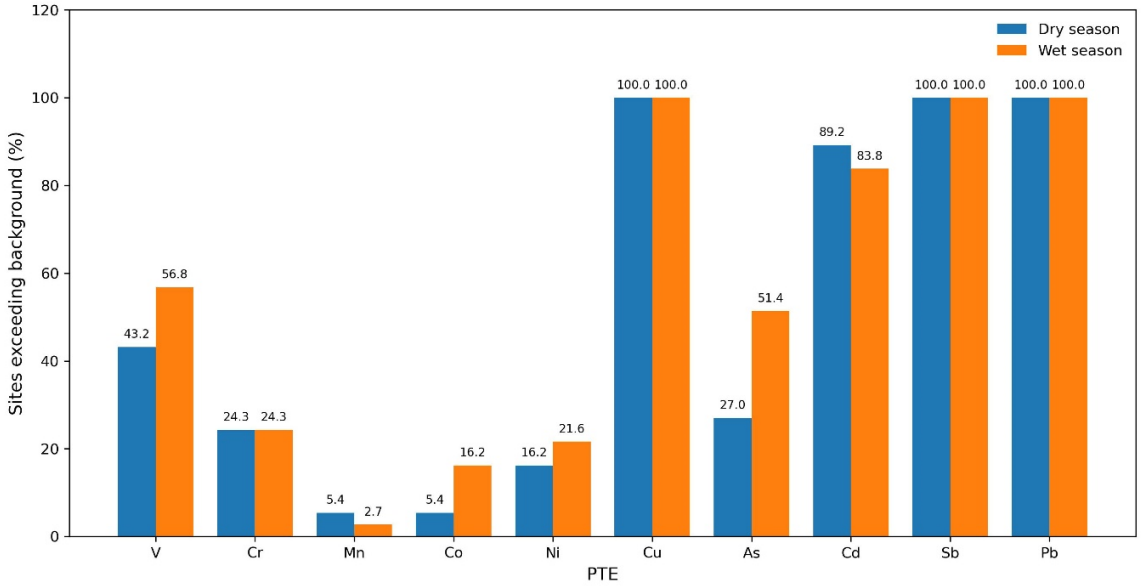


Figure S2: Boxplots of PTE concentrations in Mexico City road dust for the dry season (blue), wet season (green), and local background reference (red horizontal lines). The left panel shows Mn separately because of its higher concentration range, whereas the right panel presents V, Cr, Co, Ni, Cu, As, Cd, Sb, and Pb. Boxes represent the interquartile range, center lines indicate medians, and whiskers show data dispersion excluding outliers.

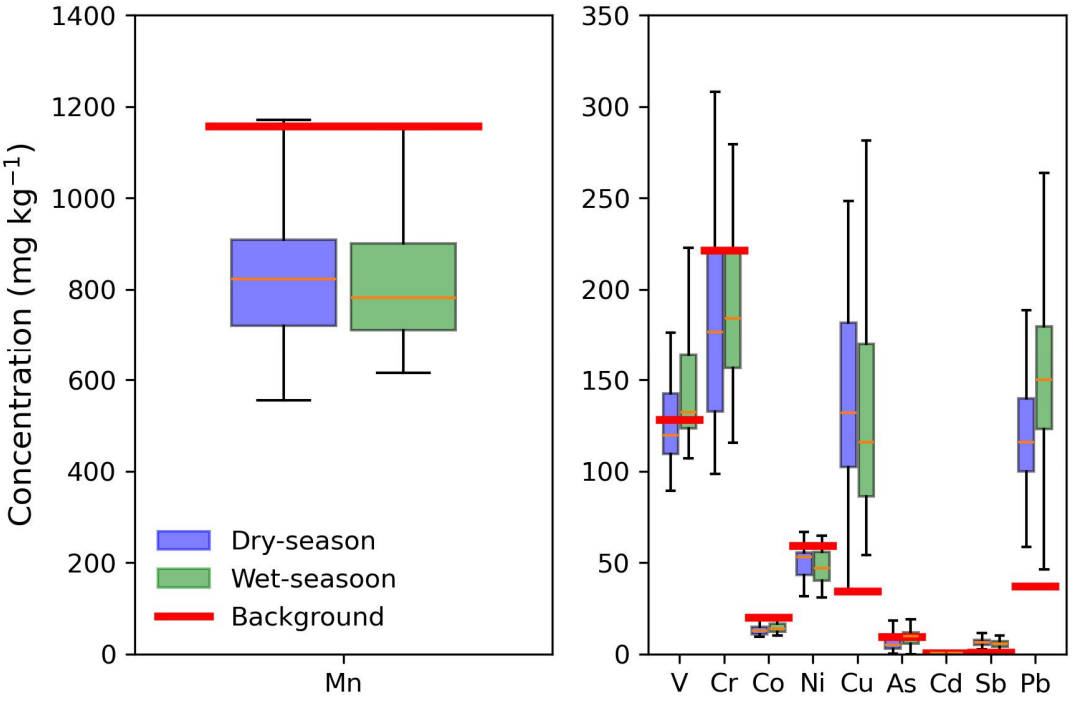


Figure S3: Seasonal PCA biplots showing the distribution of PTEs in Mexico City road dust during the dry season and wet season.

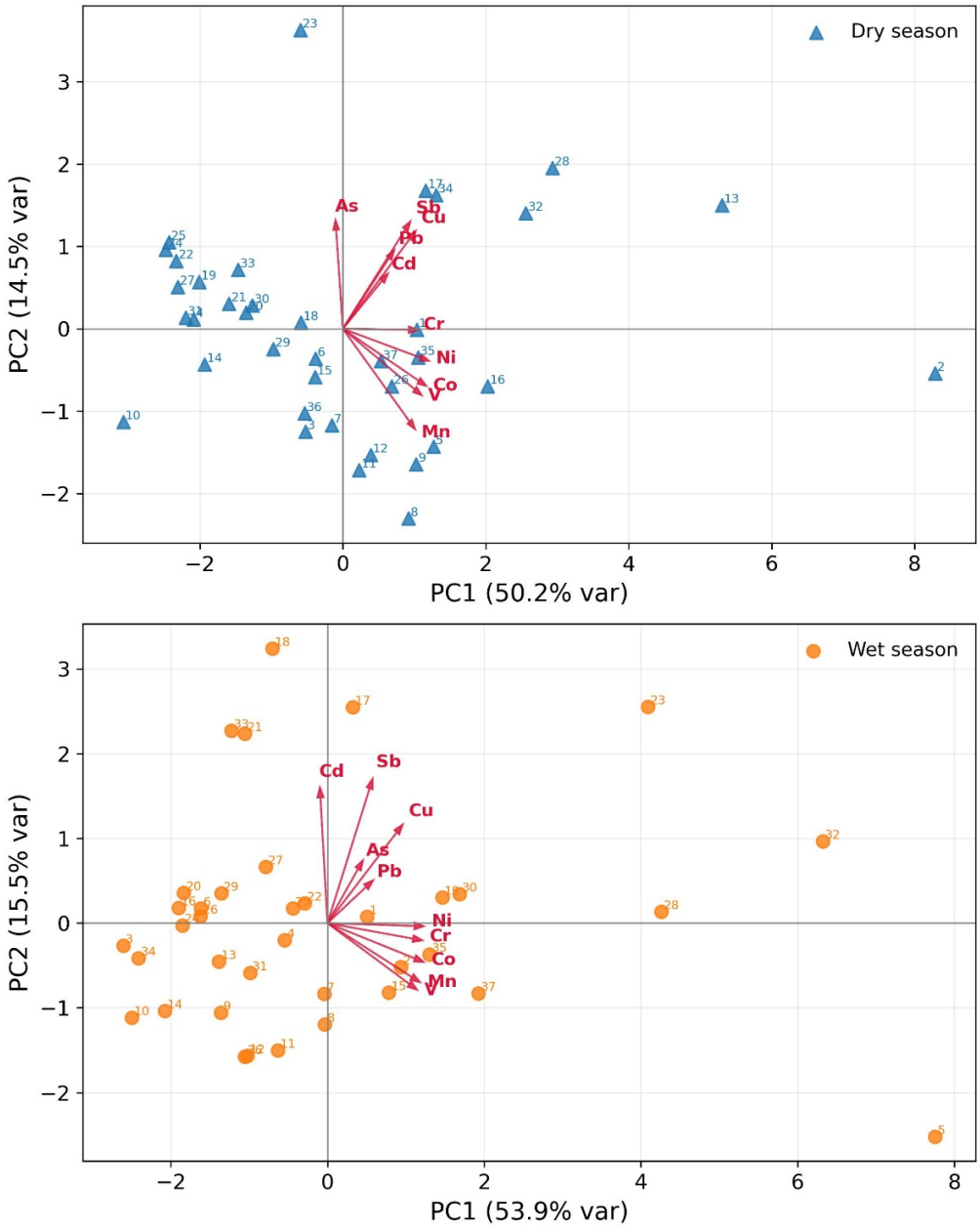
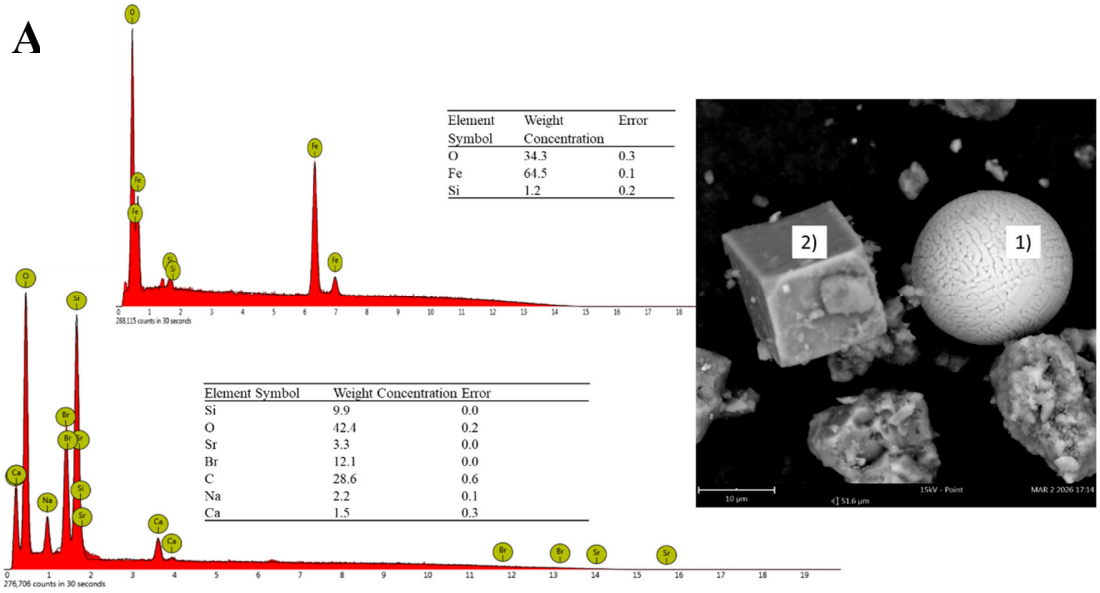


Figure S4: Representative semi-quantitative EDS spectra of selected road dust particles collected during the dry and wet seasons in Mexico City. Spectra correspond to particles shown in Figure 8 and illustrate the compositional variability of Fe-rich, Pb-bearing, silicate, and carbonaceous particles.

DRY SEASON

A

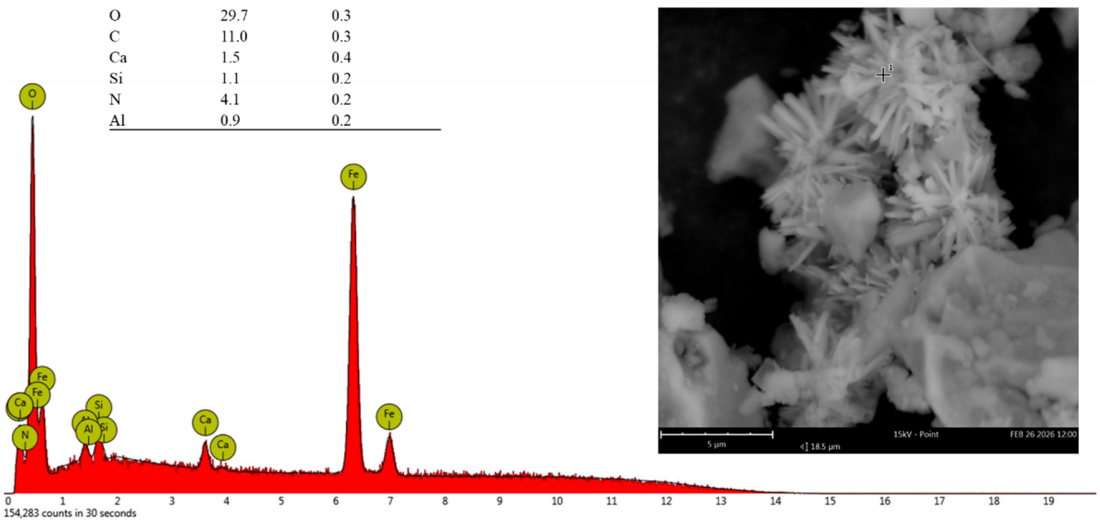


Element Symbol	Weight Concentration	Error
O	34.3	0.3
Fe	64.5	0.1
Si	1.2	0.2

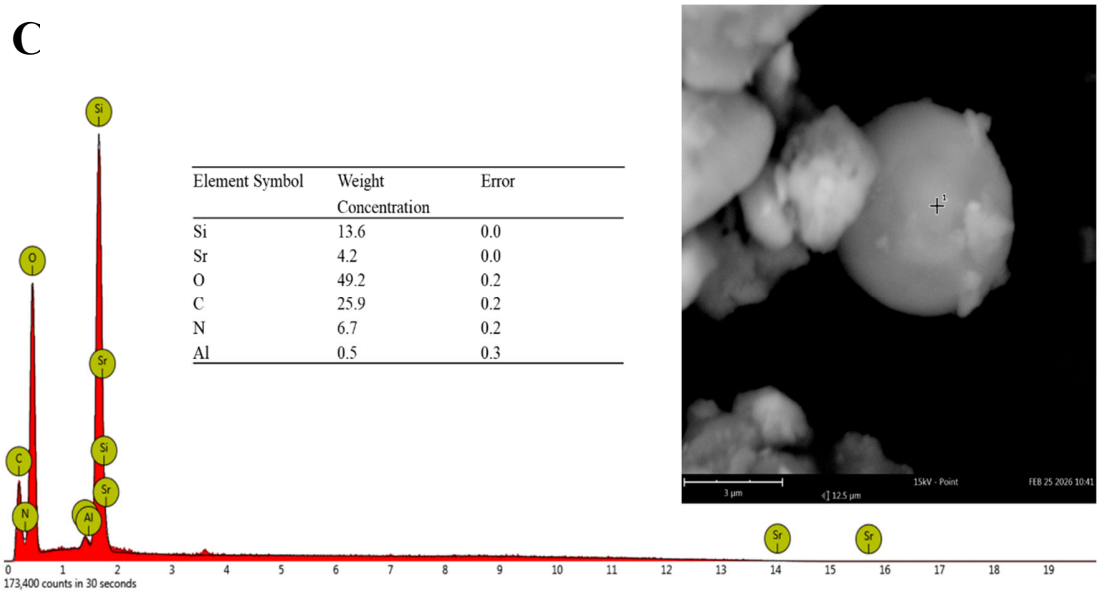
Element Symbol	Weight Concentration	Error
Si	9.9	0.0
O	42.4	0.2
Sr	3.3	0.0
Br	12.1	0.0
C	28.6	0.6
Na	2.2	0.1
Ca	1.5	0.3

B

Element Symbol	Weight Concentration	Error
Fe	51.6	0.1
O	29.7	0.3
C	11.0	0.3
Ca	1.5	0.4
Si	1.1	0.2
N	4.1	0.2
Al	0.9	0.2

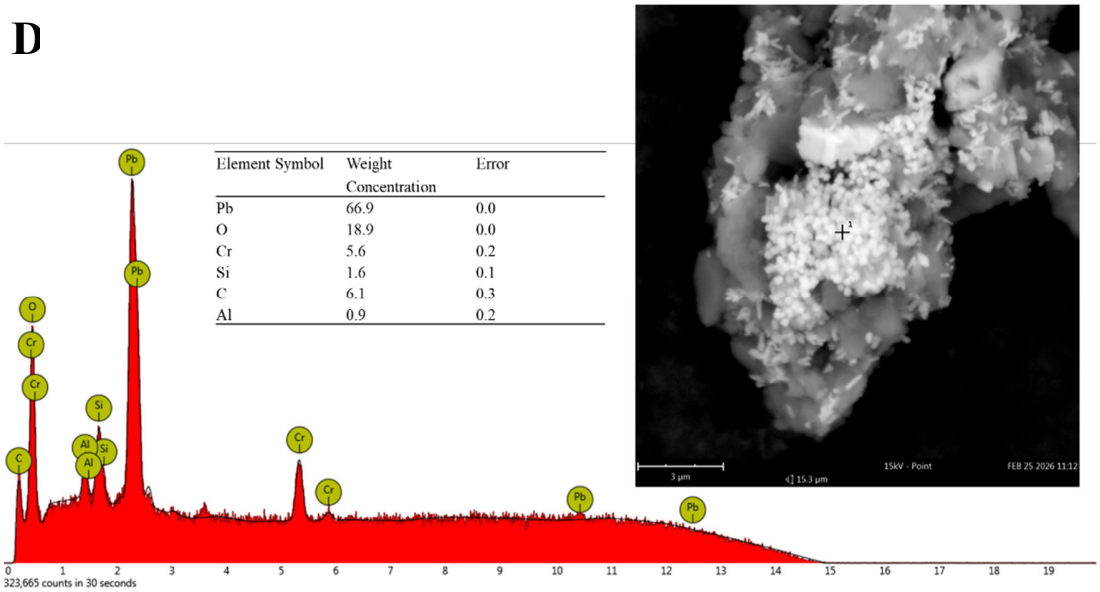


C



Element Symbol	Weight Concentration	Error
Si	13.6	0.0
Sr	4.2	0.0
O	49.2	0.2
C	25.9	0.2
N	6.7	0.2
Al	0.5	0.3

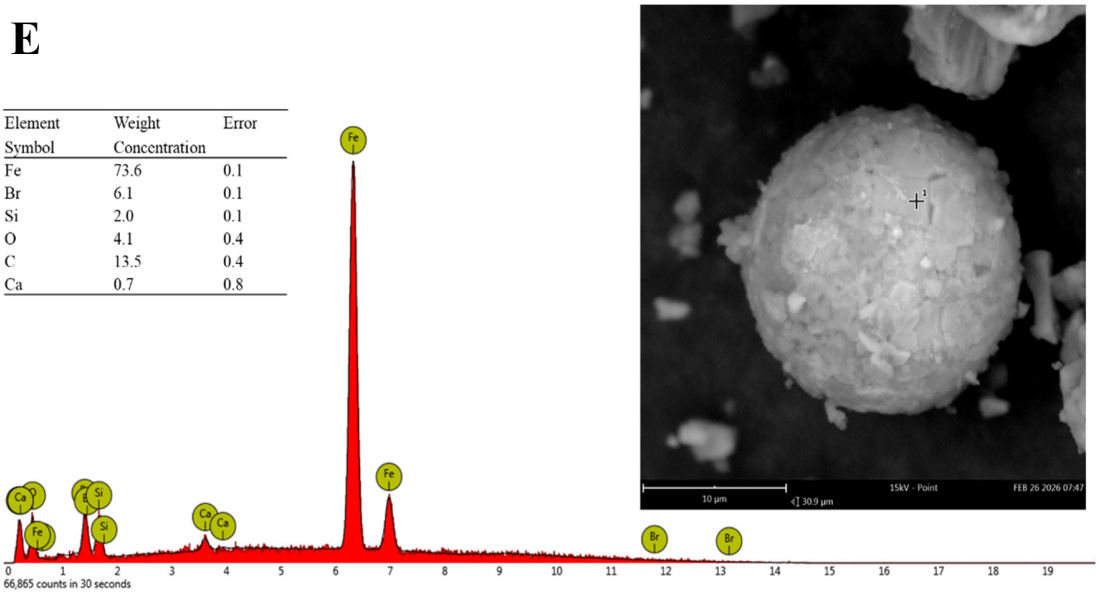
D



Element Symbol	Weight Concentration	Error
Pb	66.9	0.0
O	18.9	0.0
Cr	5.6	0.2
Si	1.6	0.1
C	6.1	0.3
Al	0.9	0.2

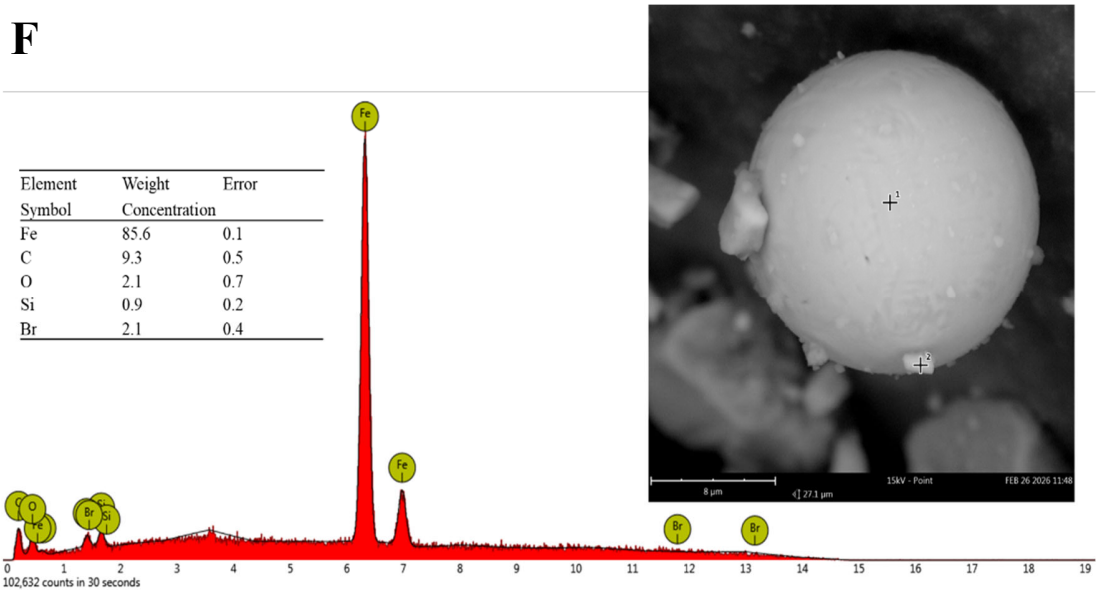
E

Element Symbol	Weight Concentration	Error
Fe	73.6	0.1
Br	6.1	0.1
Si	2.0	0.1
O	4.1	0.4
C	13.5	0.4
Ca	0.7	0.8



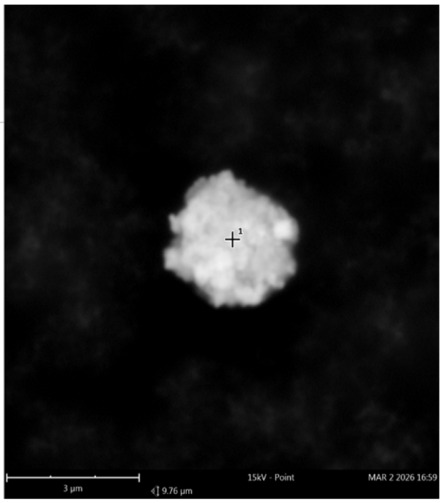
F

Element Symbol	Weight Concentration	Error
Fe	85.6	0.1
C	9.3	0.5
O	2.1	0.7
Si	0.9	0.2
Br	2.1	0.4



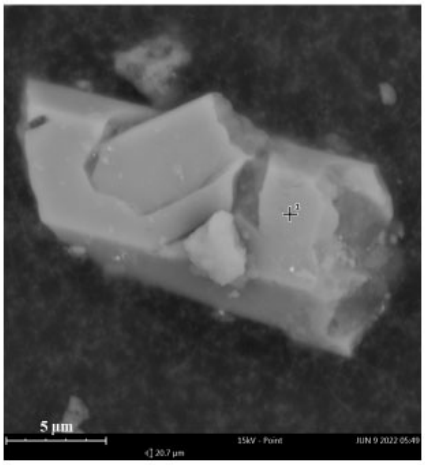
WET SEASON

G



Element Symbol	Weight Concentration	Error
Pb	79.8	0.3
C	11.8	0.6
O	8.0	0.3
Al	0.3	0.7

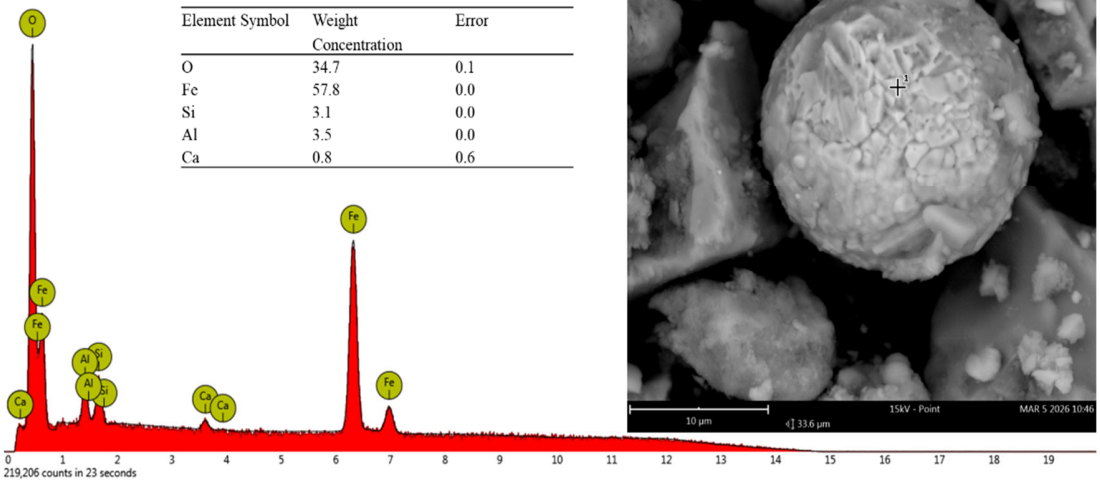
H



Element Symbol	Weight Concentration	Error
Si	13.6	0.1
O	41.4	0.5
Sr	3.4	0.0
Mg	6.3	0.2
Ca	5.3	0.1
C	23.6	0.4
Fe	5.0	0.3
Al	1.3	0.1

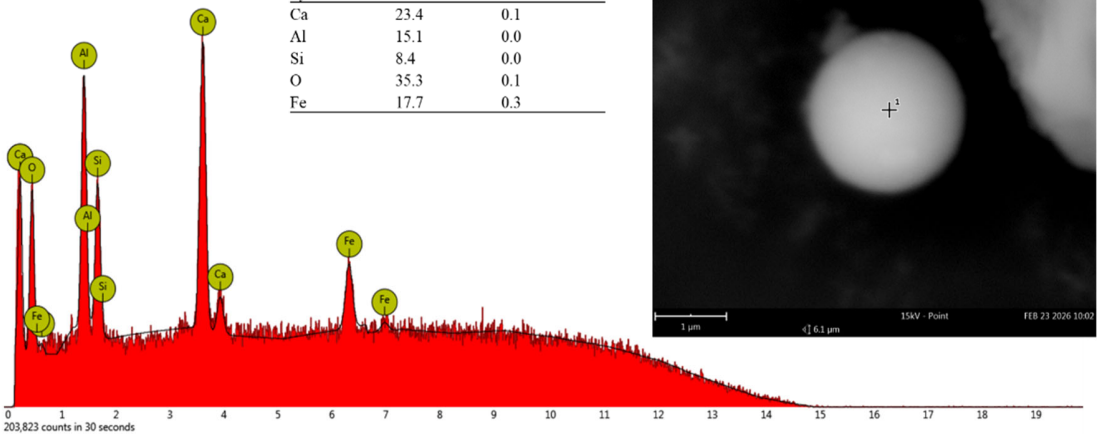
I

Element Symbol	Weight Concentration	Error
O	34.7	0.1
Fe	57.8	0.0
Si	3.1	0.0
Al	3.5	0.0
Ca	0.8	0.6



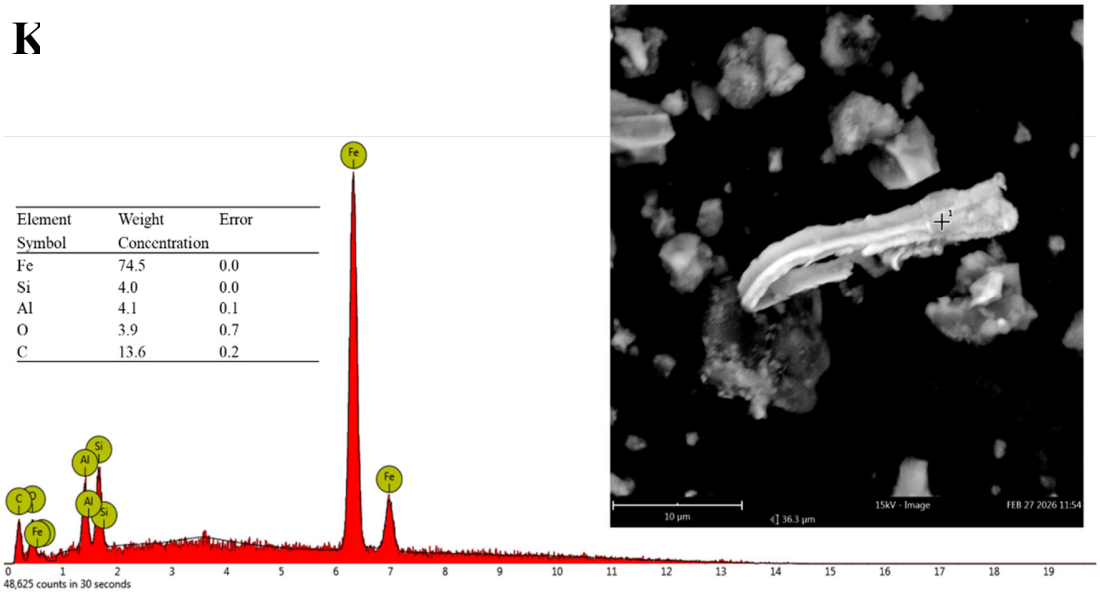
J

Element Symbol	Weight Concentration	Error
Ca	23.4	0.1
Al	15.1	0.0
Si	8.4	0.0
O	35.3	0.1
Fe	17.7	0.3



K

Element Symbol	Weight Concentration	Error
Fe	74.5	0.0
Si	4.0	0.0
Al	4.1	0.1
O	3.9	0.7
C	13.6	0.2



L

Element Symbol	Weight Concentration	Error
C	45.7	0.1
Si	2.7	0.2
K	3.7	0.3
O	21.7	0.1
Ca	2.8	1.1
Br	3.9	0.5
N	16.6	0.1
Mo	2.2	10.9
Na	0.6	0.6

