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Characteristics and source apportionment of metallic elements in $PM_{2.5}$ at urban and suburban sites in Beijing: implication of emission reduction

Miaoling Li[1,2], Zirui Liu[1*], Jing Chen[3], Xiaojuan Huang[1,4], Jingyun Liu[1,2], Yuzhu Xie[1], Bo Hu[1], Zhongjun Xu[2*], Yuanxun Zhang[5], Yuesi Wang[1,6]

[1] State Key Laboratory of Atmospheric Boundary Layer Physics and Atmospheric Chemistry (LAPC), Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029, China
[2] Department of Environmental Science and Engineering, Beijing University of Chemical Technology, Beijing 100029, China
[3] Beijing Meteorological Information Center, Beijing 100089, China
[4] Plateau Atmosphere and Environment Key Laboratory of Sichuan Province, School of Atmospheric Sciences, Chengdu University of Information Technology, Chengdu 610225, China
[5] College of Resources and Environment, University of Chinese Academy of Sciences, Beijing, 100049, China
[6] Center for Excellence in Regional Atmospheric Environment, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen 361021, China
* Correspondence: liuzirui@mail.iap.ac.cn (Z.L.); xuzj@mail.buct.edu.cn (Z.X.)

Table S1 Concentrations of metallic elements in $PM_{2.5}$ in Beijing (ng/m^3).

Source	Sampling period		Site	Mg	Al	K	Ca	V	Cr	Mn	Fe	Co	Cu	Zn	As	Ag	Cd	Pb
Sun et al., 2004 [1]	2002-2003	Summer	urban	220	530		750	19	20	30	650	3.9	40	320	10		3.7	110
		Winter	urban	320	1110		1670	2.5	20	80	1040	3.6		80	50		11.2	310
Yang et al., 2011 [2]	2005-2006	Annual Average	urban	290	790	3520		30	50	90	1130		70	530	20		50	240
Zhang et al., 2010 [3]	2007	Annual Average	Urban	1763	4116	2282	9349		70	196	4126		49	829	64		7	250
			Suburban	1087	1709	1389	2318		45	76	1437		22	323	173		8	125
Zhao et al., 2013 [4]	2009-2010	Annual Average	Urban		970		2420	3.3	19.9	72.6	1490	0.9	44.3	324	28.2		3.3	142
This study	2014	Autumn	urban	146	484	1658	637	2.2	8.9	53.8	1317	0.5	48.8	260	8.8	0.5	2.4	130
			Suburban	163	400	650	440	1.0	3.8	34.2	707	0.3	21.8	174	8.6	0.7	1.8	89

Table S2 $PM_{2.5}$ Sources identification and source contributions in Beijing by PMF model in previous studies.

Author	Sampling period	Species were Selected for PMF Analysis	Source (contribution)						
Song et al., 2006 [5]	2000	OC, EC, NO^{3-}, SO_4^{2-}, NH_4^-, Na, Al, Si, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Se, Br, Pb, and Mg	Biomass burning (11%)	Secondary sulfates (17%)	Secondary nitrates (14%)	Coal combustion (19%)	Industry (6%)	Motor vehicles (6%)	Road dust (9%)
Zíková, N. et al., 2016 [6]	2012	Na, Mg, Al, Si, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Br, Pb, NO^{3-}, SO_4^{2-}, NH_4^-, OC, and EC	Secondary sulfates (29.3%)	Traffic (24.7%)	Secondary nitrates (18.8%)	Biomass combustion (11.7%)	Coal combustion (11.1%)	Soil (4.3%)	
Jin et al., 2014 [7]	2013	Mg, Al, Si, P, S, Cl, K, Ca, Ti, Cr, Mn, Fe, Ni, Cu, Zn, Br, Pb, Cd, and BC	Coal burning (29.2%)	Vehicle exhaust and waste incineration (26.2%)	Construction industry (22.3%)	Soil (15.4%)	Industry with chlorine (5.9%)		
Yu et al.., 2013 [8]	2013	Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, As, Se, Br, Ba, and Pb	Secondary sulphur (26.5%)	Vehicle exhaust (17.1%)	Fossil fuel combustion (16.0%)	Road dust (12.7%)	Biomass burning (11.2%)	Soil dust (10.4%)	Metal processing (6.0%)
	2013		Secondary aerosols (40.7%)	Biomass/Waste burning and coal combustion (22.6%)	Traffic related pollution (10.0%)	Long-range transport (22.3%)	Fugitive soil and Sand dust (4.4%)		
Yang et al., 2016 [9]	2014 before heating (APEC)	NO^{3-}, SO_4^{2-}, Cl^-, NH^{4-}, Ca^{2+}, K^+, Na^+, Mg^{2+}, Al, Zn, Cu, Pb, As, Cd and WSOC	Secondary aerosols (15.7%)	Coal combustion (22.9%)	Biomass/Waste burning (33.3%)	Traffic related pollution (18.1%)	Long-range transport (5.3%)	Fugitive soil and Sand dust (4.7%)	
	2014 during heating		Secondary aerosols (30.6%)	Coal combustion (21.7%)	Biomass/Waste burning (11.2%)	Traffic related pollution (14.9%)	Long-range transport (12.5%)	Fugitive soil and Sand dust (9.1%)	
Huang et al., 2014 [10]	2013	Organic matter (OM), Sulphate, Nitrate, Ammonium, Elemental Carbon (EC), Chloride, and Trace Elements	Traffic (5.6%)	Coal burning (26.1%)	Biomass burning (5.6%)	Cooking (1.6%)	Dust related (10.0%)	Secondary organic-rich (25.8%)	Secondary inorganic-rich (25.3%)
Wang et al., 2016 [11]	2014-2015	OC, EC, WSOC, n-WSOC, Sulphate, Nitrate, Ammonium, K, Mg, Ca, Al, As, Ba, Cd, Co, Cu, Mn, Ni, Pb, Sb, Sr, Ti, Tl, V, and Zn	Secondary aerosols (47.8%)	Traffic exhaust (25.5%)	Industrial emission (9.9%)	Road dust (9.7%)	Soil dust (4.0%)	Biomass burning (1.7%)	Residual oil combustion (1.4%)

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