Supporting Information

Four metal elements quantitative analysis and pollution source discriminant in atmospheric sedimentation by laser induced breakdown spectroscopy (LIBS) coupled with machine learning

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Table S1 Concentrations of other elements in atmospheric sedimentation samples(wt.%)

No.sample	Si	Ca	Fe	Al	K	Ti	S	Zn	Cu	Pb	other
01#	36.76	31.79	13.01	9.319	4.866	1.613	1.266	0.269	0.104	0.064	0.939
02#	35.47	29.43	16.96	9.797	4.921	1.549	0.451	0.194	0.115	0.078	1.035
03#*	33.72	37.01	11.57	9.926	4.986	1.489	0.330	0.096	0.072	0.029	0.772
04#	32.84	35.26	12.74	11.233	5.019	1.679	0.096	0.133	0.082	0.028	0.890
05#	36.33	30.26	13.92	9.753	5.742	1.531	1.253	0.154	0.096	0.043	0.918
06#*	39.76	29.01	14.20	9.095	4.466	1.695	0.459	0.279	0.122	0.063	0.851
07#	37.55	29.81	14.51	9.631	5.109	1.642	0.473	0.220	0.119	0.091	0.845
08#	48.63	26.70	8.941	8.342	4.120	1.363	0.549	0.059	0.028	0.017	1.251
09#*	35.41	30.87	14.39	9.639	5.625	1.535	1.136	0.276	0.116	0.115	0.888
10#	42.99	22.25	15.16	10.580	5.848	1.691	0.112	0.219	0.198	0.056	0.896
11#	43.31	13.09	20.01	12.687	7.073	1.838	0.210	0.350	0.130	0.117	1.185
12#*	43.94	20.07	15.02	11.453	6.241	1.707	0.168	0.235	0.197	0.068	0.901
13#	46.55	19.08	13.75	10.966	6.263	1.591	0.263	0.391	0.178	0.127	0.841
14#	38.49	27.06	14.82	10.219	5.492	1.740	0.705	0.294	0.097	0.163	0.920
15#*	42.39	21.20	16.00	10.510	6.519	1.616	0.302	0.205	0.205	0.156	0.897
16#	31.61	27.33	19.88	10.204	6.217	1.913	0.956	0.425	0.144	0.114	1.207

* indicates selected as validation sample

Table S2 The predictive performance of standard curve method for Pb, Cu, Zn and Al

Element	R^2_p	RMSEP
Pb	0.8627	0.0281
Cu	0.7978	0.0534
Zn	0.8412	0.1036
Al	0.8236	1.4206

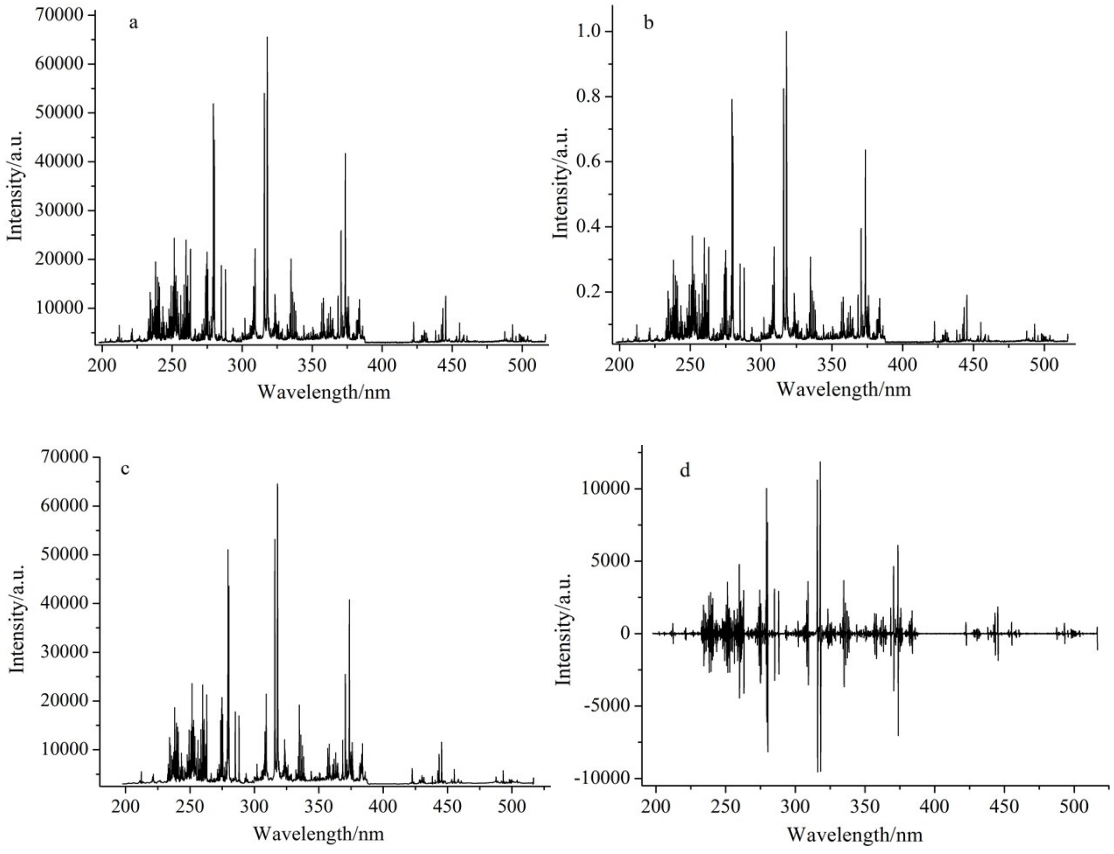
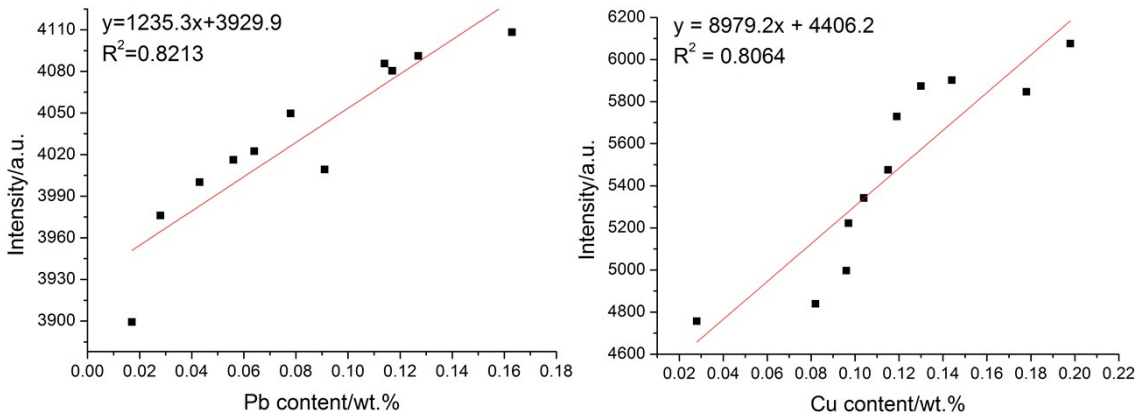


Fig. S1 The LIBS spectra of 16# sample with different pretreatment method methods(a: unprocessed; b: maximum

spectral intensity; c: wavelet transform; d: 1st derivative)



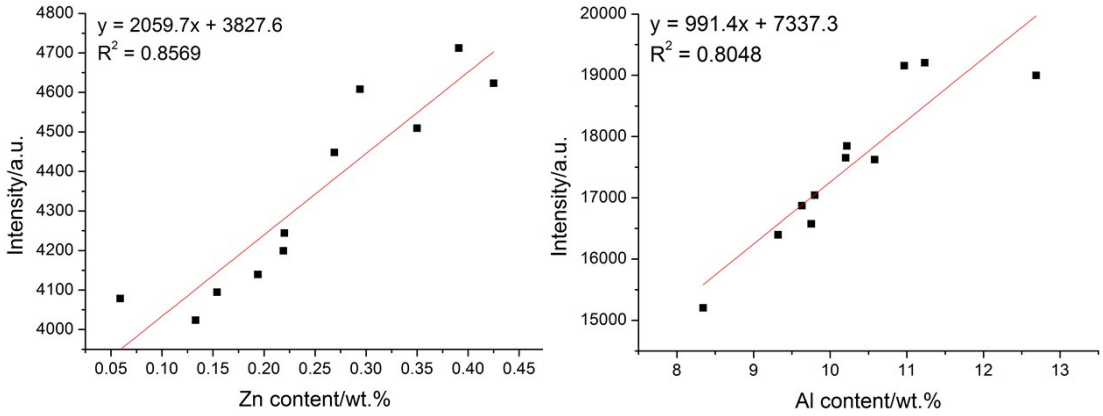


Fig. S2 Standard curve constructed by metal element concentration and LIBS spectral intensity