

# Supplementary Information (SI)

**Submitted to:** Aerosol and Air Quality Research.

**Title:** Emission Characteristics of Hazardous Atmospheric Pollutants from Ultra-Low Emission Coal-fired Industrial Boilers in China

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Table S1 Average Contents of trace elements in coal and bottom ash for the tested coal-fired boilers

	Hg	Cd	Cr	Pb	As
Heavy metal in Coal ( mg kg <sup>-1</sup> )	0.045	<0.6	6.18	7.43	6.92
Heavy metal in bottom ash ( mg kg <sup>-1</sup> )	0.007	<0.6	20.7	27.41	7.18

Table S2 REF of bottom ash for the tested coal-fired boilers

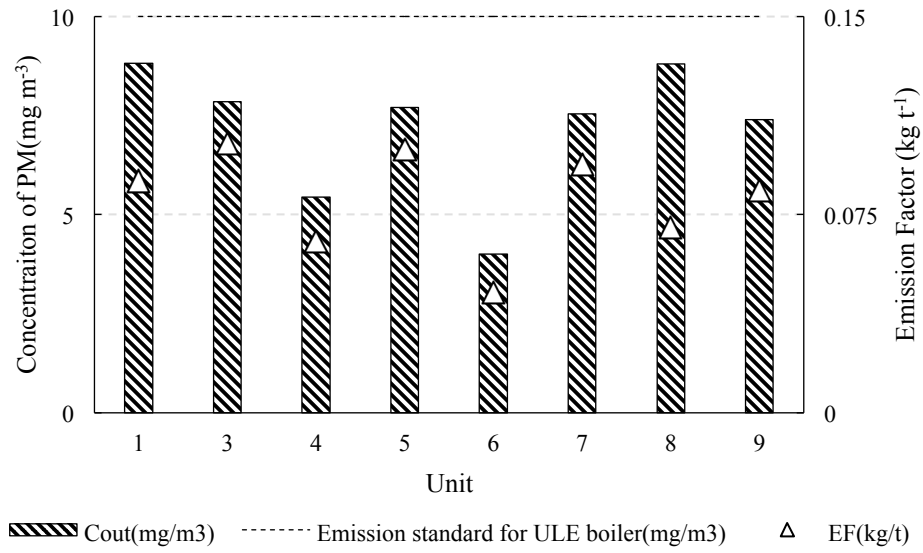
Boiler Type	Index	REF for bottom ash			
		Hg	Cr	Pb	AS
CFB	Avg	0.04	0.80	1.21	0.25
	Std	0.03	0.44	0.96	0.28
	Num	5	6	6	6
	Max	0.08	1.36	2.72	0.80
	Min	0.00	0.37	0.08	0.05
GF	Avg	0.05	0.40	0.14	0.20
	Std	0.04	0.06	0.03	0.23
	Num	7	4	3	3
	Max	0.13	0.48	0.18	0.47
	Min	0.01	0.35	0.11	0.03

Table S3 Release ratio of elements in coal and bottom ash for the tested coal-fired boilers

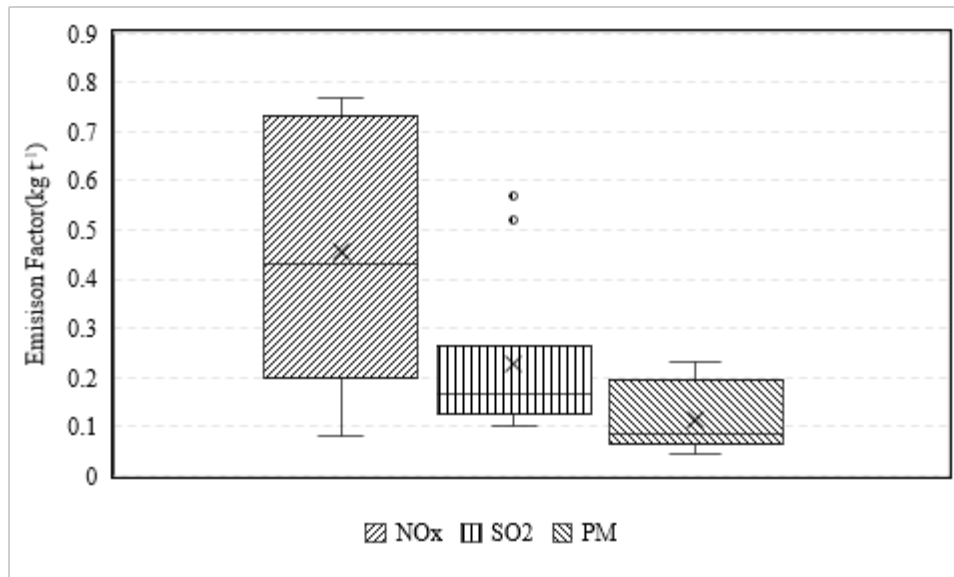
Boiler Type	Index	Release ratio for heavy metal			
		Hg	Cr	Pb	As
CFB	Avg	97.87%	57.94%	52.41%	86.64%
	Std	1.59%	22.98%	35.98%	14.55%
	Num	5	6	5	6
	Max	99.75%	80.80%	95.91%	97.40%
	Min	95.76%	28.42%	10.90%	57.90%
GF	Avg	95.14%	62.96%	86.90%	81.27%
	Std	3.87%	5.41%	3.19%	21.60%
	Num	7	4	3	3
	Max	98.67%	67.78%	90.07%	97.13%
	Min	87.72%	55.38%	83.69%	56.66%

Table S4 Unbated NO<sub>x</sub> emission factor for different boiler type

Boiler Type	NO <sub>x</sub> (kg t <sup>-1</sup> )
GF	2.94
CFB	2.5
PC	4.72



**Fig. S1.** Emission concentration and emission factor of PM for ULE boilers



**Fig. S2.** NO<sub>x</sub>, SO<sub>2</sub> and PM emission factor for APCDs required by ULE coal-fired boilers