

**Supplementary Information for:**

**Emissions and chemical components of PM<sub>2.5</sub> from simulated cooking conditions using traditional cookstoves and fuels under a dilution tunnel system**

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**Supplementary Table 1.** Average elemental concentrations in ng m<sup>-3</sup> for each fuel type. Uncertainties shown are standard errors.

<b>Element</b>	<b>CCP</b>	<b>KKP</b>	<b>MFP</b>	<b>MKP</b>	<b>MCC</b>
Mn	0.10 ± 0.02	0.05 ± 0.01	0.14 ± 0.03	0.06 ± 0.02	0.21 ± 0.09
Co	0.03 ± 0.01	0.01 ± 0.00	0.08 ± 0.04	0.03 ± 0.01	0.03 ± 0.01
Ni	0.23 ± 0.14	0.11 ± 0.02	0.37 ± 0.10	0.25 ± 0.08	0.06 ± 0.05
Cu	0.40 ± 0.07	0.52 ± 0.05	0.45 ± 0.08	0.57 ± 0.15	0.09 ± 0.03
As	0.09 ± 0.07	1.08 ± 0.07	0.01 ± 0.00	0.01 ± 0.00	0.09 ± 0.07
Sr	0.30 ± 0.03	0.21 ± 0.03	0.32 ± 0.05	0.40 ± 0.02	0.35 ± 0.12
Cd	0.02 ± 0.00	0.02 ± 0.00	0.03 ± 0.01	0.04 ± 0.02	1.0 ± 0.9
Pb	0.39 ± 0.07	0.66 ± 0.13	0.53 ± 0.18	0.60 ± 0.11	15 ± 11

**Supplementary Table 2.** Average measured ion concentrations for different fuel types tested. Negative concentrations are not reported. Uncertainties shown are standard errors.

<b>Ion</b>	<b>Concentration, µg m<sup>-3</sup></b>				
	<b>MCC</b>	<b>CCP</b>	<b>KKP</b>	<b>MFP</b>	<b>MKP</b>
Na <sup>+</sup>	0.75 ± 0.25	0.54 ± 0.15	-	-	43 ± 22
NH <sub>4</sub> <sup>+</sup>	0.02 ± 0.04	-	1.04 ± 0.17	-	-
K <sup>+</sup>	8.8 ± 0.8	23.0 ± 1.9	1.71 ± 0.24	0.35 ± 0.08	0.07 ± 0.04
Mg <sup>2+</sup>	0.02 ± 0.02	-	0.02 ± 0.00	0.02 ± 0.00	0.01 ± 0.00
Ca <sup>2+</sup>	0.3 ± 0.4	-	0.17 ± 0.03	0.12 ± 0.07	0.03 ± 0.03
Cl <sup>-</sup>	6.7 ± 0.5	12.3 ± 1.0	3.5 ± 0.5	0.45 ± 0.13	0.20 ± 0.07
SO <sub>4</sub> <sup>2-</sup>	0.79 ± 0.13	2.55 ± 0.20	0.02 ± 0.05	0.25 ± 0.04	0.37 ± 0.13
NO <sub>3</sub> <sup>-</sup>	0.07 ± 0.09	0.14 ± 0.13	0.20 ± 0.06	-	-

**Supplementary Table 3.** Average measured WSOC for the different fuel types tested. Uncertainties shown are standard errors.

Pollutant Source (N = number of trials)	WSOC, $\mu\text{g C m}^{-3}$
MCC N = 8	$3.4 \pm 0.6$
CCP N = 9	$4.1 \pm 0.7$
KKP N = 8	$21.8 \pm 0.7$
MFP N = 9	$0.36 \pm 0.19$
MKP N = 9	$0.05 \pm 0.03$

**Supplementary Table 4.** Average measured monosugars ( $\mu\text{g m}^{-3}$ ) for the different fuel types tested. Sugars were not detected in all fractions. ND stands for Not Detected. Uncertainties shown are standard errors.

	Levoglucosan	N	Mannosan	N	Galactosan	N
MCC	$10.21 \pm 2.64$	8	$0.83 \pm 0.22$	8	$0.21 \pm 0.09$	3
CCP	$0.47 \pm 0.14$	9	$0.06 \pm 0.01$	9	$0.04 \pm 0.00$	3
KKP	$78.72 \pm 6.96$	8	$3.72 \pm 0.35$	8	$1.64 \pm 0.16$	8
MFP	$0.76 \pm 0.34$	9	$0.09 \pm 0.03$	8	$0.09 \pm 0.03$	4
MKP	ND	ND	$4.43 \pm 5.87$	6	ND	ND

**Supplementary Table 5.** Pearson correlation coefficients between biomass burning tracers. Shown in parenthesis is the number of pairs of data values used to compute coefficients. Only the values of correlations that are statistically significant at 95.0% confidence level are shown. No significant correlations were observed for charcoal, as well as kerosene.

	Levoglucosan	Mannosan	Galactosan	K <sup>+</sup>
<b>MCC</b>				
Levoglucosan	1			
Mannosan	0.97 (8)	1		
Galactosan	0.71 (8)	0.77 (8)	1	
K <sup>+</sup>	-	-	-	1
<b>KKP</b>				
Levoglucosan	1			
Mannosan	0.99 (8)	1		
Galactosan	0.97 (8)	0.99 (8)	1	
K <sup>+</sup>	-	-	-	1
<b>MFP</b>				
Levoglucosan	1			
Mannosan	0.96 (9)	1		
Galactosan	0.98 (9)	0.89 (9)	1	
K <sup>+</sup>	-	-	-	1

**Supplementary Table 6.** Pearson correlation coefficients for ions in PM<sub>2.5</sub> sampled from different materials. Only the values of correlations that are statistically significant at 95.0% confidence level are shown.

	Na <sup>+</sup>	NH <sub>4</sub> <sup>+</sup>	K <sup>+</sup>	Mg <sup>2+</sup>	Ca <sup>2+</sup>	Cl <sup>-</sup>	SO <sub>4</sub> <sup>2-</sup>	NO <sub>3</sub> <sup>-</sup>
<b>MCC</b>								
Na <sup>+</sup>	1							
NH <sub>4</sub> <sup>+</sup>	-	1						
K <sup>+</sup>	-	-0.68	1					
Mg <sup>2+</sup>	-	-	-	1				
Ca <sup>2+</sup>	-	-	-	0.94	1			
Cl <sup>-</sup>	-	-	0.97	-	-	1		
SO <sub>4</sub> <sup>2-</sup>	-	-	0.66	-	-	0.67	1	
NO <sub>3</sub> <sup>-</sup>	0.73	-	-	-	-	-	-	1
<b>CCP</b>								
Na <sup>+</sup>	1							
NH <sub>4</sub> <sup>+</sup>	0.75	1						
K <sup>+</sup>	-	-	1					
Mg <sup>2+</sup>	-	-	-	1				
Ca <sup>2+</sup>	-	-	-0.70	0.86	1			
Cl <sup>-</sup>	-	-	0.90	-	-	1		
SO <sub>4</sub> <sup>2-</sup>	-	-	-	-	-	-	1	
NO <sub>3</sub> <sup>-</sup>	-	-	-	-	-	-	-	1
<b>KKP</b>								
Na <sup>+</sup>	1							
NH <sub>4</sub> <sup>+</sup>	0.77	1						
K <sup>+</sup>	-	-	1					
Mg <sup>2+</sup>	-	-	-	1				
Ca <sup>2+</sup>	-	-	-	0.89	1			
Cl <sup>-</sup>	-	0.78	0.95	-	-	1		
SO <sub>4</sub> <sup>2-</sup>	0.75	-	-	-	-	-	1	
NO <sub>3</sub> <sup>-</sup>	-	-	-	-	-	-	-	1
<b>MFP</b>								
Na <sup>+</sup>	1							
NH <sub>4</sub> <sup>+</sup>	-	1						
K <sup>+</sup>	-	-	1					
Mg <sup>2+</sup>	-0.71	-	-	1				
Ca <sup>2+</sup>	-	-	0.77	-	1			
Cl <sup>-</sup>	-	-	0.72	-	0.89	1		
SO <sub>4</sub> <sup>2-</sup>	-	-	-	0.71	0.67	-	1	
NO <sub>3</sub> <sup>-</sup>	-	-	-	-	0.78	0.76	-	1

<b>MKP</b>								
Na <sup>+</sup>	1							
NH <sub>4</sub> <sup>+</sup>	-	1						
K <sup>+</sup>	-	-	1					
Mg <sup>2+</sup>	-0.75	-	-	1				
Ca <sup>2+</sup>	-	-	-	-	1			
Cl <sup>-</sup>	0.70	-	-	-	-	1		
SO <sub>4</sub> <sup>2-</sup>	0.96	-	-	-	-	0.83	1	
NO <sub>3</sub> <sup>-</sup>	-	-	-	-	-	-	-	1

**Supplementary Table 7.** Summary of particle mass concentrations for all fuel and cookstove types, and the reported identified and unidentified proportions for each.

	<b>Average particle mass concentration, μg m<sup>-3</sup></b>	<b>N</b>	<b>Identified mass concentration, μg m<sup>-3</sup> (refer to Fig. 7)</b>	<b>% identified</b>	<b>% unidentified</b>
<b>Chicken (MCC)</b>	$2.84 \pm 0.99 \times 10^3$	8	24.51	0.86	99.14
<b>Charcoal (CCP)</b>	$5.58 \pm 1.89 \times 10^3$	9	30.93	0.55	99.45
<b>Sawdust (KKP)</b>	$1.16 \pm 0.20 \times 10^4$	8	109.76	0.95	99.05
<b>Fuelwood (MFP)</b>	$1.56 \pm 1.30 \times 10^3$	9	1.76	0.11	99.89
<b>Kerosene (MKP)</b>	$2.85 \pm 1.41 \times 10^3$	9	43.49	1.53	98.47