

## 1 **Supplementary Materials**

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4 Table S1. Peak values and R squares of the average density distribution of 50, 100,  
5 200, and 400 nm particles at 20 °C (room temperature), 150 °C, and 300 °C.

	50 nm			100 nm			200 nm			400 nm		
	$x_{c1}$	$x_{c2}$	$R^2$	$x_{c1}$	$x_{c2}$	$R^2$	$x_{c1}$	$x_{c2}$	$R^2$	$x_{c1}$	$x_{c2}$	$R^2$
20°C	1.167	\	0.980	0.933	1.454	0.979	0.939	1.519	0.9697	1.344	1.917	0.966
150 °C	0.972	1.642	0.951	0.981	1.691	0.932	0.984	1.746	0.949	1.094	1.798	0.911
300 °C	0.976	1.756	0.851	0.994	1.851	0.864	1.030	1.857	0.850	1.157	2.051	0.779

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40 Table S2. Single scattering albedo (SSA) at wavelengths of 530 nm and 450 nm and  
41 Ångström absorption exponent (AAE) of total biomass burning particles at 20 °C  
42 (room temperature), 150 °C, and 300 °C.

Temperature	SSA		AAE
	450 nm	530 nm	
Room temperature (20 °C)	0.750	0.897	$6.230 \pm 0.160$
150 °C	0.533	0.723	$5.047 \pm 0.246$
300 °C	0.469	0.560	$2.229 \pm 0.292$

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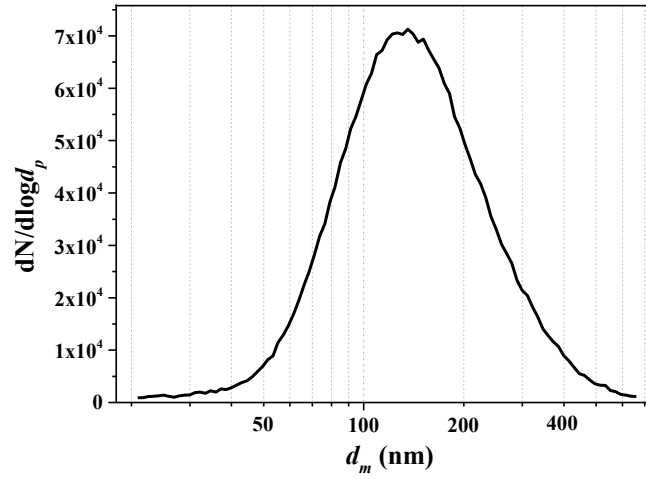
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69 Figure S1. Average number size distribution of biomass burning particles.

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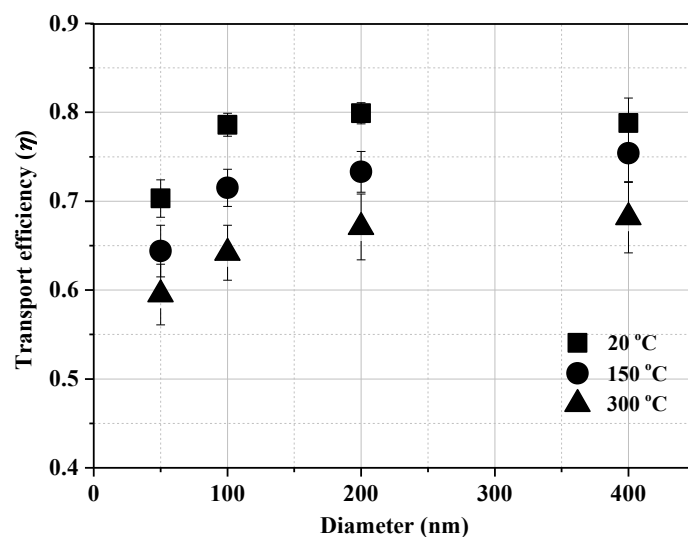
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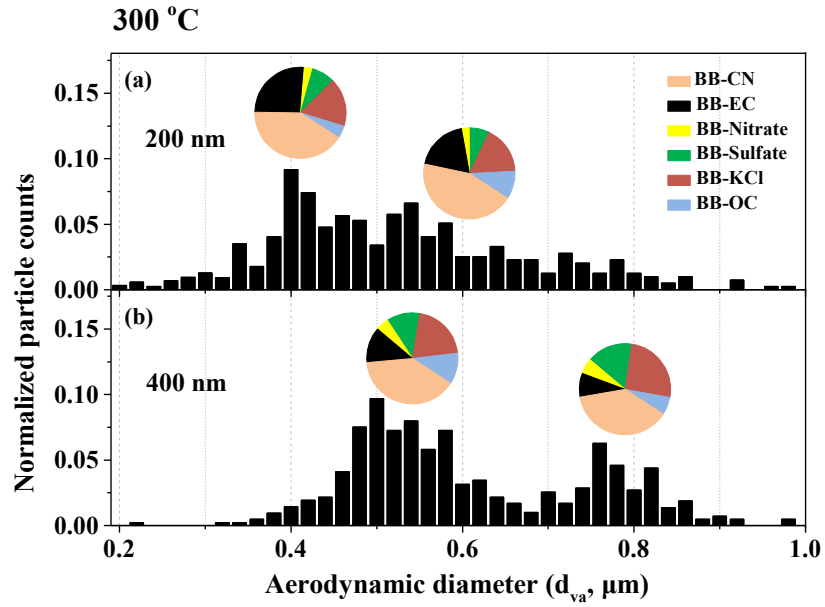
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Figure S2. Transport efficiency of NaCl in the thermodenuder as a function of particle diameter and heating temperature.



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112 Figure S3. Vacuum aerodynamic size distributions detected by the SPAMS of 200 nm  
 113 and 400 nm electrical mobility size-selected biomass burning particles and pie charts  
 114 for the particle types in different aerodynamic modes at 300 °C.

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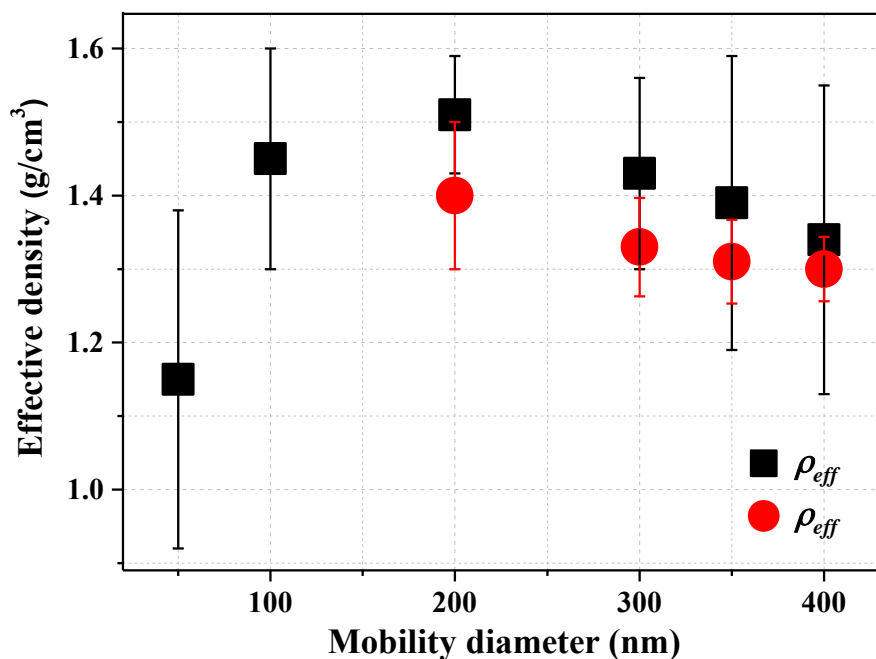
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129 Figure S4. Size-resolved effective density of biomass burning particles determined by

130 two methods.  $\rho_{eff}^I$  is effective density from mobility and mass measurements (based

131 on the DMA-APM-CPC system) while  $\rho_{eff}^{II}$  is from mobility and aerodynamic

132 measurements (DMA-SPAMS system). The effective density of each size is the

133 average peak value of the dominant mode from different scans. Error bars represent

134 the standard deviations of the five replicate test results.

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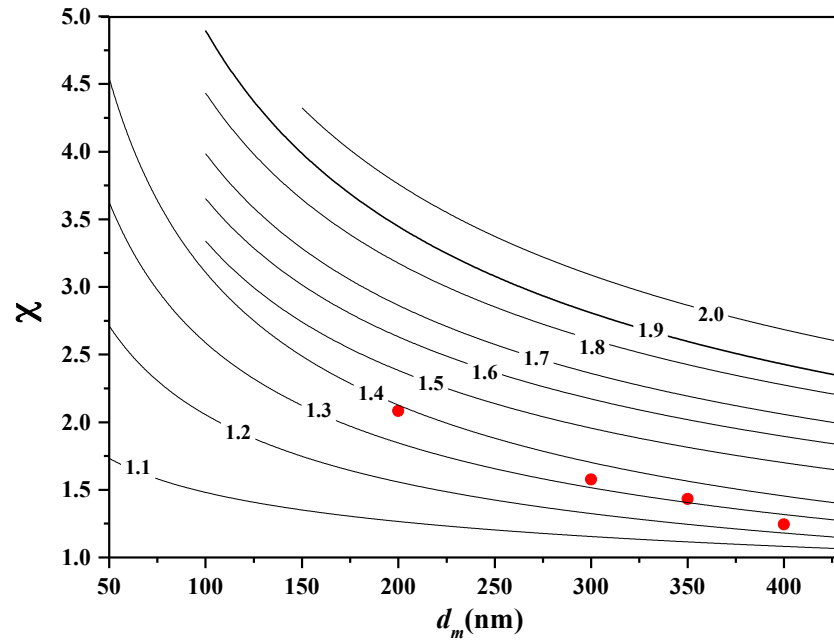
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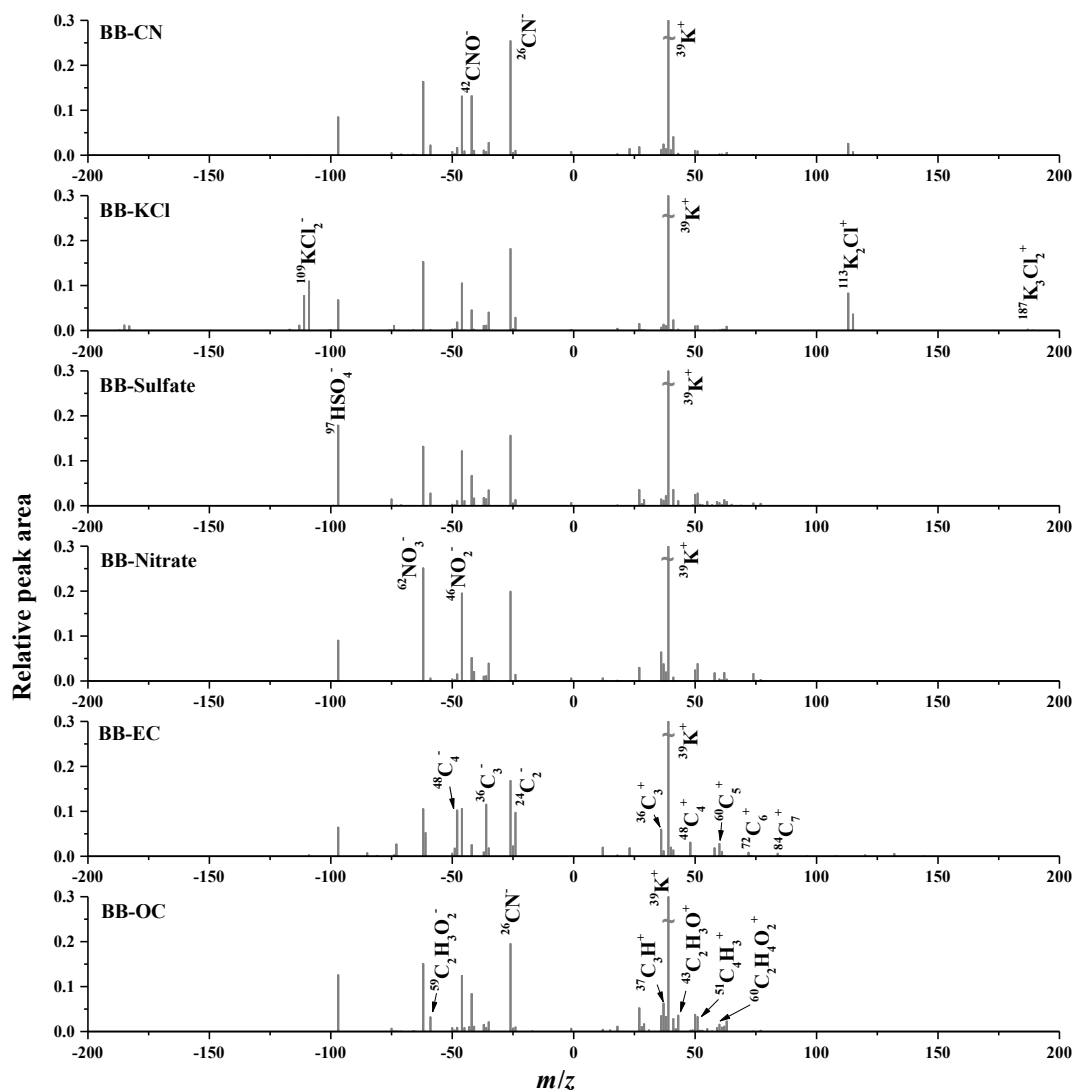
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150 Figure S5. Contour plot of the ratio of the estimated particle mass ( $m_p$ ) to the exact  $m_p$ .

151 The estimated  $m_p$  was obtain by replacing  $\rho_{eff}^I$  with calculated  $\rho_{eff}^{II}$  in Equation (2).

152 The ratios of the estimated  $m_p$  by replacing  $\rho_{eff}^I$  with exact  $\rho_{eff}^{II}$  in Equation (2) to

153 the exact  $m_p$  was shown as well (red dots).



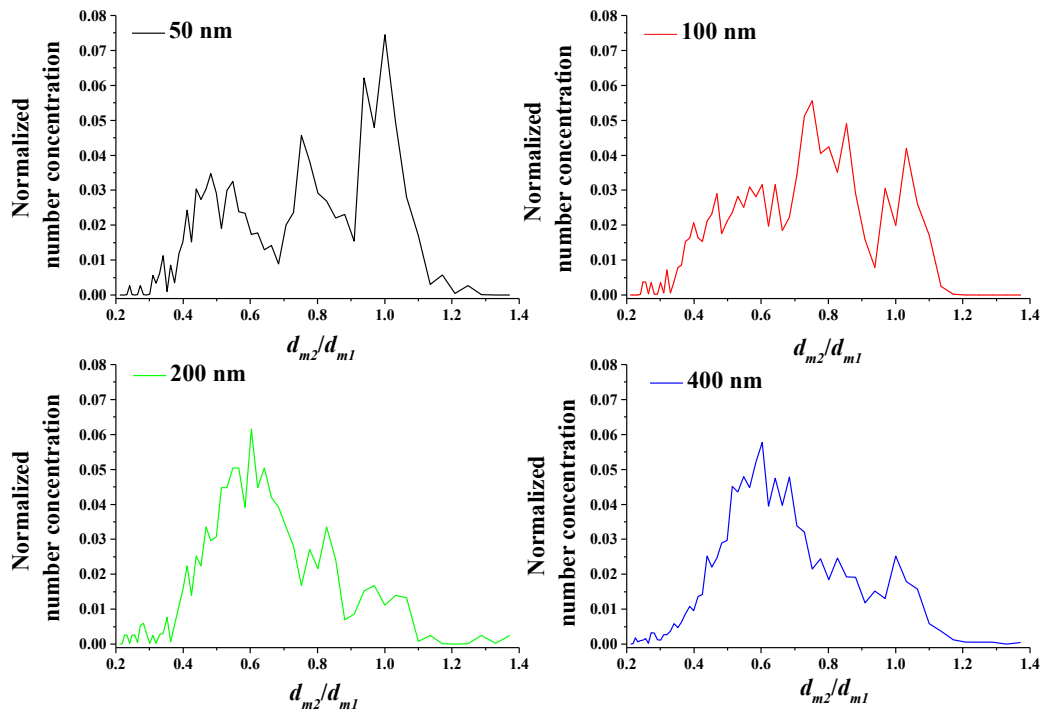
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155 Figure S6. Average mass spectra of 6 particle types classified from biomass burning  
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Figure S7. The size change ( $d_{m2}/d_{m1}$ ) for particles in the size range of 50-400 nm when heated at 300 °C.