Supplementary Information

Materials and Methods

Microscopy

The italic number shown in the figure represent the order at which the locations have been scanned. If the areas shown in Figure S.1 are poorly populated, over-populated, damaged, or particular concerns, close areas were analyzed.

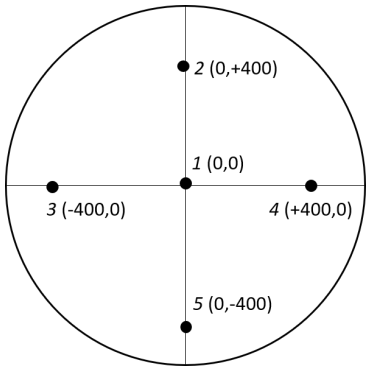

Figure S.1 Locations on the TEM grids at which 5 to 7 images have been taken. If the location shows an overloaded sample or a damaged carbon film, it was not considered and more images have been taken at another location. The italic number shown per each location indicates the order at which the locations have been scanned.

Image analysis

The aggregate and primary particles diameters were analyzed using the pair correlation function (Dastanpour, 2016). The pair correlation function P(r) is a weighted average of the particle density at a given radius *r*. For binary images, this function estimates the probability of finding another pixel at a distance r from a reference pixel. This method was validated and verified using both synthetic and real TEM images. The comparison of these two types of images, along with the comparison with previous TEM image analysis code, generate good agreements. In addition, this code has been recently updated to facilitate its use. One major issue of the code was the quality and the grayscale of the images collected. If some particles show a similar gray tone compared to the background, they cannot be recognized. The recent improvements facilitate the modifications of the images' grayscale and a more accurate selection of the primary particles contained in the agglomerates.

Results and discussions

Table S. 1 summarizes the d_a and d_p for each load % and fuel type examined.

Table S. 1 List of the geometric average projected-equivalent-area diameter (d_a) and of the primary particle diameter (d_p) for each case studied. Geometric mean and standard errors are shown for both d_a and d_p.

Fuel type	Load %	d_a [nm]	d_p [nm]
NG	11	361 ± 2.6	39.8 ± 1.4
	31	474 ± 2.8	38.7 ± 1.7
	31	548 ± 2.7	43.1 ± 1.1
	50	515 ± 3.8	38.5 ± 1.9
	50	552 ± 2.9	42.1 ± 1.2
	75	604 ± 3.8	45.2 ± 1.5
	90	639 ± 3.8	43.8 ± 1.8
	90	673 ± 4.3	47.4 ± 2.1
	5	302 ± 2.6	33.3 ± 1.6
	5	430 ± 3.1	39.7 ± 1.8
Diesel	25	304 ± 1.7	36.2 ± 1.7
	25	326 ± 3.4	38.3 ± 1.8
	60	375 ± 2.5	37.3 ± 1.8
	75	445 ± 2.9	48.6 ± 1.6
	75	607 ± 3.3	37.5 ± 1.3
	0	295 ± 1.7	35.1 ± 1.1
	0	399 ± 2.1	39.6 ± 1.4
	0	448 ± 3.9	42.6 ± 1.7

In Figure S.2, the relation between primary particle diameter and the projected-equivalent-area diameter according to the effect of the collection time. Particles' morphological properties were independent of the sample collection time.

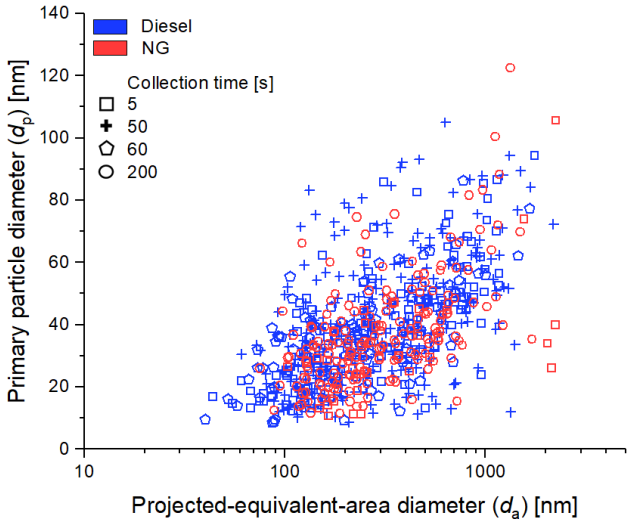

Figure S.2 Relationship between primary particle diameter, and projected area diameter according to the influence of the collection time.

References

Dastanpour, R. (2016). Characterization of primary particle size variation and its influence on measurable properties of aerosol soot, PhD thesis, University of British Columbia.