Characteristics of submicron particle during high concentration episodes in spring, 2014 at Seoul, Korea, using the aerosol mass spectrometer

J.S. Park, H.J. Shin, I.H. Song, S.M. Park and Y.D. Hong

Air Quality Research Division, National Institute of Environmental Research, 215 Jinheungno, Eunpyeong-gu, Seoul, 122-706, Korea

Keywords: High PM episode, AMS, Long range transport, Secondary aerosol formation.

Presenting author email: psofc@korea.kr

This study is aimed to qualitatively estimate the source of high PM episodes in Seoul metropolitan area. The inorganic and organic composition of non-refractory $PM_{1.0}$ was measured by high resolution time of flight aerosol mass spectrometer (HR-ToF-AMS) during high PM episodes (Feb. '14 ~ Mar. '14).

The ionized mass spectrum data of organic matter was then analyzed by PMF (Positive Matrix Factorization) in order to identify the account of local emission and long range transport in high PM episodes and to provide scientific data for improvement of national air quality forecasting. As a result, six components of the organics were resolved including organic aerosols emitted from various primary combustion sources such as hydrocarbon-like organic aerosol (HOA), and cooking-related organic aerosol (COA) as well as three types of oxidized organic aerosols (OOAs), and nitrogen-rich organic aerosol (NOA).

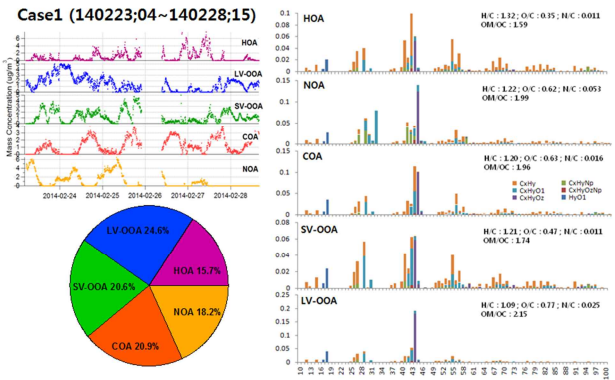

Figure 1. The time series and average composition of OA(left) ; the mass spectra of OA components in Case 1(right).

Table 1. The average concentration of PMF-identified OA components.

(unit : μg/m^3)	Case 1	Case 2	Case 3+4
HOA	0.92 (15.7 %)	1.15 (15.1 %)	0.32 (10.1 %)
NOA	1.07 (18.2 %)	1.91 (25.0 %)	0.66 (20.8 %)
COA	1.23 (20.9 %)	2.20 (28.9 %)	0.49 (15.3 %)
SV-OOA	1.21 (20.6 %)	0.94 (12.3 %)	-
LV-OOA	1.45 (24.6 %)	1.43 (18.8 %)	0.47 (14.9 %)
LO-OOA	-	-	0.44 (13.7 %)
MO-OOA	-	-	0.80 (25.2 %)

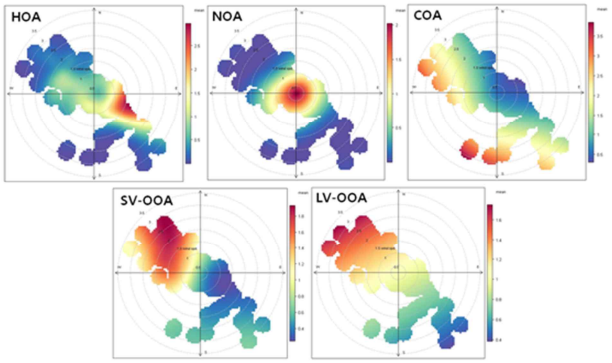

Figure 2. The pollution rose of OA components in high concentration episodes.

Real-time component analysis of fine particle ($PM_{1.0}$) using AMS can identify the characteristics and cause of various air pollution cases and effectively measure the trend of air quality, making it a crucial component in national air quality forecasting. Through component analysis of high PM episodes, the effect of local emission and long range transport has been identified. Further, we believe this would provide important information required for validation and improvement of chemical model in national air quality forecasting.

Jimenez, J. L., Jayne, J. T., Shi, Q., Kolb, C. E., Worsnop, D. R., Yourshaw, I., Seinfeld, J. H., Flagan, R. C., Zhang, X., Smith, K. A., Morris, J. and Davidovits, P. (2003) *Ambient aerosol sampling with an Aerosol Mass Spectrometer*, Journal of Geophysical Research-Atmospheres. 108(D7):8425.

Canagaratna, M. R., Jayne, J. T., Jimenez, J. L., Allan, J. D., Alfarra, M. R., Zhang, Q., Onasch,T. B., Drewnick, F., Coe, H., Middlebrook, A., Delia, A., Williams, L. R., Trimborn, A. M., Northway, M. J., DeCarlo, P. F., Kolb, C. E., Davidovits, P., Worsnop, D. R. (2007) *Chemical and microphysical characterization of ambient aerosols with the aerodyne aerosol mass spectrometer*, Mass Spectrometry Reviews. 26, 185-222.

Zhang, Q., Jimenez, J. L., Canagaratna, M. R., Ulbrich, I. M. N., Ng, L., Worsnop, D. R., Sun, Y. (2011) *Understanding atmospheric organic aerosols via factor analysis of aerosol mass spectrometry: a review*, Analytical and Bioanalytical Chemistry. 401:3045–3067.