



Fog-Water Chemicals and PAHs in PM10 of Foggy Days in Nanjing

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Fog water samples during six heavy fog events were collected at Nanjing University of Information Science and Technology (NUIST) during 15 November 2007 to 31 December 2007. Five kinds of water-soluble anion and fourteen kinds of metal element concentration were detected by the ion chromatograph and the plasma emission spectrometer. The results showed that the pH values ranged from 4.64 to 6.88 among these fog water samples. The average SO_4^{2-} anion concentration ($2864.9\mu\text{mol}\cdot\text{L}^{-1}$) was the highest in fog water, followed by Cl^{-} ($1584.4\mu\text{mol}\cdot\text{L}^{-1}$) and NO_3^{-} ($736.0\mu\text{mol}\cdot\text{L}^{-1}$). The average concentration of heavy metal elements Cu, Ni, Pb, Cd and Cr were $2.30, 1.46, 0.42, 0.41$ and $0.37\mu\text{mol}\cdot\text{L}^{-1}$ respectively while the Ca, K, Na, Mg, Al and Zn concentration with big value. The concentration of metal elements in fog water was high at the initial fog stage, then decreased with the fog development, whereas increased significantly after sunrise during traffic peak period. Obvious diurnal variation of NO_2^{-} was manifested as higher value at the night while very low or disappearing after sunrise. The average pH of fog water(6.20) was higher than rain water(4.91), but the conductivity of fog water was 10.5 times higher than that of rain water. The concentration of heavy metal elements(Cd,Cr,Ni,Cu and Pb) and water-soluble anions(SO_4^{2-} , NO_3^{-} , Cl^{-}) in fog water was far higher than rain water.

Based on meteorological data and aerosol samples from Nov.15 to Dec.30,2007 in the north suburb of Nanjing, size distribution characteristics of polycyclic aromatic hydrocarbons (PAHs) in PM10 in foggy and sunny days were studied, and the concentrations of 16 PAHs were analyzed by gas chromatography with mass selective detection (GC-MS).The average concentrations of aerosols in the night (PM2.1: $120.34\mu\text{g}\cdot\text{m}^{-3}$; PM9.0: $215.92\mu\text{g}\cdot\text{m}^{-3}$) are close to those in the daytime (PM2.1: $126.76\mu\text{g}\cdot\text{m}^{-3}$; PM9.0: $213.41\mu\text{g}\cdot\text{m}^{-3}$) in fog days. The average concentrations of aerosols are higher in the night (PM2.1: $71.45\mu\text{g}\cdot\text{m}^{-3}$; PM9.0: $114.33\mu\text{g}\cdot\text{m}^{-3}$) than those in the daytime (PM2.1: $41.02\mu\text{g}\cdot\text{m}^{-3}$; PM9.0: $74.38\mu\text{g}\cdot\text{m}^{-3}$) in fine days. And we also find that the total concentrations of 16 PAHs in PM2.1 ($49.97\text{ng}\cdot\text{m}^{-3}$) and PM9.0 ($59.45\text{ng}\cdot\text{m}^{-3}$) in foggy days are 1.50 and 1.46 times of those (PM2.1: $33.30\text{ng}\cdot\text{m}^{-3}$; PM9.0: $40.80\text{ng}\cdot\text{m}^{-3}$) in sunny days separately. The average maximum concentrations of individual PAHs are fluoranthene, which are higher (PM2.1: $7.98\text{ng}\cdot\text{m}^{-3}$;PM9.0: $9.99\text{ng}\cdot\text{m}^{-3}$) in foggy days than those (PM2.1: $5.23\text{ng}\cdot\text{m}^{-3}$;PM9.0: $6.77\text{ng}\cdot\text{m}^{-3}$)in fine days, and the average concentrations of benzo-a-pyrene are higher in fog days (PM2.1: $1.77\text{ng}\cdot\text{m}^{-3}$;PM9.0: $1.99\text{ng}\cdot\text{m}^{-3}$) than those in sunny days (PM2.1: $1.46\mu\text{g}\cdot\text{m}^{-3}$; PM9.0: $1.84\text{ng}\cdot\text{m}^{-3}$).