1.027 Measurement of the chemical components of aerosol particles with different electrostatic charging state.

Early Career Scientist

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Abstract:

Several studies have reported that the particle deposition in human airways is strongly enhanced by its electrostatic charging state. These facts clearly provide that aerosol particles with electrostatic charge deposit greater on human airways than it is expected from the particle size. Therefore, electrostatic charging state of aerosol particles is one of the key parameters of the human health impacts caused by aerosol. Nevertheless, few studies have focused on electrostatic charging state of atmospheric aerosol particles. In this study, we measured the chemical components of aerosol particles with different electrostatic charging state, in order to find out the relationship between electrostatic charging state of atmospheric aerosol particles and its sources.
To separate aerosol particles by different electrostatic charging state, we developed an experimental equipment composed of parallel electrode plate of aluminum and exterior structure of acrylic resin. The device named K-MACS (Keio-Measurement system of Aerosol Charging State) is designed to separate the aerosol particles by means of electric mobility. The K-MACS can separate the introduced aerosol particles into three types of electric charging state; particles with positive charge, particles with no charge or a small number of charges, and particles with negative charge.
We separated ambient aerosol particles into 3 types of electrical charging states using the K-MACS and collected aerosol particles respectively on quartz-fiber filter. Collected aerosol particles with different electrical charging state were analyzed by energy dispersive X-ray fluorescence spectrometry (EDXRF). Then, we calculated the element components proportion of electrically separated aerosol to ambient aerosol. As a result, aerosol particles separated as particles with no charge or a small number of charges had largest proportion for all element components. Also, particles with negative charge had larger proportion than those with positive charge for most element components.