

Mineralogical description of aerosol particles collected at the summit of Mt. Fuji

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Aerosol particles which were called yellow sand (Kosa) occur in wasteland regions of central Asia. They are transported in the upper troposphere and reach to Pacific coast area in North America, through Korea and Japan. Aerosol particles like yellow sand have impact on atmospheric environment in the East Asia. The summit of Mt. Fuji locates above atmospheric boundary layer (ABL) in the early spring, and we can collect aerosol particles which are transported in upper troposphere. It is difficult for contaminated materials to climb to the summit of Mt. Fuji. Therefore, aerosol particles which was collected at summit of Mt. Fuji is adequate to assess original composition of aerosol in upper troposphere. We carried out TEM observation and mineralogical description of the aerosol particles collected at the summit of Mt. Fuji during yellow sand event.

The samples of aerosol particles were collected by using High volume air sampler (Shibata HVC1000) by Meteorological Research Institute of Japan Meteorological Agency in cooperation with observatory of Mt. Fuji in the early spring in 2002.

Mineralogy of the particles is quartz, alkali feldspar, muscovite, biotite and gypsum. In addition to these minerals, amorphous silicate spherical grain, some types of soot, and multi-wall carbon nanotubes (MWCNTs) were observed by TEM. The particles are composed mainly of minerals which may be originated from soil particles. Gypsum grains of evaporate minerals which is distributed in arid regions are included in collected particles. The results of mineral composition are regarded as reflecting occurrence in wasteland regions of central Asia. However, there is a possibility that sulfate minerals such as gypsum were formed by atmospheric reaction of gaseous phase of sulfuric acid which was generated by combustion of fossil fuel from industrial area of china or emitted from de-sulfurization equipment in thermal power stations.

Spherical grain of fly ash and soot aggregate are regarded as the grains which may be originated from the oil-combustion of diesel truck and jet engine. Soot aggregate often stick to edge of other particles. Aerosol soot particle plays an important role as atmospheric environmental factor, because they have a close relationship with water in atmosphere as cloud condensation nuclei (CCN). In addition, soot particles bring water on surface of minerals by sticking to minerals in atmosphere, and advance the reaction between liquid or gaseous phase of sulfuric acid and minerals. Therefore, soot particles are regarded as agents who advance chemical reaction of mineral aerosol particles by sticking to minerals in atmosphere.

MWCNTs were recognized in the samples. MWCNTs are generated by arc-discharge method, and carbon nanotubes do not occur commonly in nature. Carbon nanotubes which were 0.01 μm in diameters were recognized in particles which occurred from graphitic brake pads on automobile (Murr and Bang, 2003). Graphitic brake pads of automobile are scarcely used in Japan to cause environmental pollution. One possibility is that carbon nanotubes are due to graphitic brake pads of automobile.