

Chemistry and sulfur and oxygen isotope ratios of sulfate ion of water soluble component of suspended particulate matter at Okayama city.

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Suspended particulate matters (SPM and PM2.5) have been collected at Okayama University, Okayama city in order to elucidate their chemical nature, origin and relationship with sulfate ion in precipitation. SPM and PM2.5 were sampled once a month and duration of the sampling is 96 hours. Water soluble components of SPM and PM2.5 were extracted ultrasonically. Their chemical compositions were analyzed by ion chromatography and sulfur and oxygen isotope ratios were analyzed by EA-IRMS and TC/EA-IRMS, respectively.

Soluble components of PM and PM2.5 are overwhelmingly composed NH_4^+ and SO_4^{2-} , thus seems to be mainly $(\text{NH}_4)_2\text{SO}_4$. There is no significant compositional difference in SPM and PM2.5.

Sulfur isotopic ratio of sulfate in water soluble components in SPM and PM2.5 at Okayama city is high in winter and low in other seasons, similar to nss-sulfate in precipitation. However, their sulfur isotope ratios in autumn and winter are 1 to 2‰ higher than those of nss-sulfate in precipitation. High sulfur isotope ratios in winter seem to be affected by sulfur compounds originated from coal combustion in China. However, they are clearly lower than those of sulfate in total suspended particulate matter in Beijing (Han et al., 2016) and indicate that, even in winter, contribution of sulfur originated from coal-combustion in China seems to be small at Okayama city and local source may mainly contribute to sulfate of suspended particulate matter. Furthermore, sulfur isotope ratios of nss-sulfate in PM2.5 at Niigata city (Inomata et al., 2016) agree generally with our data at Okayama city.

Oxygen isotope ratios of soluble components in SPM and PM2.5 seem to be high in winter. Oxygen isotope ratios of nss-sulfate of precipitation is also high in spring. However, the cause of this phenomena is not clear now.

Present data suggests that the direct contribution of trans-border transport of SPM and PM2.5 from China is limited at Okayama city and/or that sulfur and oxygen isotope signatures of sulfate in water soluble components of SPM and PM2.5 are greatly altered during transport from China to Okayama.

Keywords: Water soluble components of suspended particulate matter, Okayama, Sulfur isotope ratio of sulfate, Oxygen isotope ratio of sulfate