Speciation of Metals on Atmospheric Nanoparticle
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In general, particulate matter (PM) in atmosphere can be classified to PM10 (<10 µm), PM2.5(<2.5 µm), and UFP (<100 nm), based on the particle size. Previous studies have suggested that fine fraction of the PM can potentially penetrate into deep respiratory system and cause various adverse health effects including increase in carcinogenic risk and even heritable mutation. On the other hand, there are various reactions between nanoparticles and biological tissues, which can be summarized in Fig. 1 modifying the diagram in Nel (2006). It is obvious that these interactions and the effects strongly depend on the speciation and form of constituent elements. In these several years, we have been focusing on the speciation of metals particularly associated with fine fraction of PM to elucidate the toxicity of those particles. Research target was urban PM collected in Detroit, USA, Fukuoka, Japan, Hefei, China, and NIST standard sample (SRM1649a). A variety of analytical techniques including state-of-the-art electron microscopy and synchrotron-based X-ray absorption fine structure have been utilized. The results obtained from these samples reveal the complex mixing state of toxic metals and the size-dependent phase heterogeneity bearing the elements of interest. This presentation summarizes our recent projects particularly focusing on the speciation of metals: Fe, Pb, Cr, and Mn.

Fig. 1. A brief summary of interaction between nanoparticle and biological tissue. After Nel (2006) Science

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