Study on the factors of fine particulate matter ($PM_{2.5}$) and nanoparticles in the roadside environment

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Abstract

This study (2014-2016) is planned to estimate the contribution of traffic source to the atmospheric $PM_{2.5}$ at the roadside environment determined by two methods. First, size-resolved sampling is simultaneously conducted at roadside and background sites around the Rinko-keisatsusyo-mae traffic intersection in Kawasaki city, and chemical analysis is conducted and results are compared between two sites. Second, reanalysis of data of the nanoparticle monitoring at this traffic intersection conducted by the Ministry of the environment and the National Institute of Environmental Studies since 2004.

Observation in the roadside and background sites were simultaneously conducted in January to February 2015. The intraday variations of particle number concentrations, NOx, and $PM_{2.5}$ showed peaks in the morning and these peaks correspond to increase of the traffic volume. $PM_{2.5}$ and size-resolved samples were also collected using low volume samplers and low pressure

cascade impactors at both sites. The samples were analyzed for mass, elemental carbon (EC), organic carbon (OC), water-soluble ionic components, and metals. The average $PM_{2.5}$ were 24.9 μg m^{-3} and 19.4 μg m^{-3} in roadside and background site, respectively. Although they were lower than environment standard value, the roadside concentrations were higher which may be due to impact of traffic. Comparing between roadside and background sites show EC was the most enrichment chemical component among other chemical species, especially in particle size of 10-56 nm. In this size range, the concentration of EC was 11 times higher in the roadside compare to background site. Also, concentrations of OC, Cr, Fe, and Zn in this size range were more than double in roadside site compare to background site. Their concentrations in roadside $PM_{2.5}$ were also higher than those in background site. These chemical species may be emitted from automobile exhausts and non-tail pipe emissions such as road dust. This study found the traffic is still influence on $PM_{2.5}$ and nanoparticle in roadside atmospheric environment.