

Measurement of roadside air pollution with a biomonitoring method and relation of traffic volume

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Abstract

Though air pollution caused by atmospheric particulate matter has been a serious problem in Japan, it is difficult to measure atmospheric particulate matter at a lot of roadsides because of the limited number of the monitoring stations. Therefore we focused on biomonitoring technique with ginkgo leaves. Ginkgo leaves were collected along major arteria roads in Osaka City in spring, summer and autumn in 2014, 2015, 2016 and 2017, and in Kyoto City in 2017 autumn. The particles retained on leaves were removed by ultrasonic cleaning into ethanol solution. The ethanol solution including particles was suctioned by an aspirator. Particles were collected on PTFE filter. Particles on filter were quantified by Particle Induced X-ray Emission (PIXE) analysis. The total mass and the total element mass(20 elements: Na, Mg, Al, Si, P, S, Cl, K, Ca, Ti, V, Cr, Mn, Fe, Ni, Cu, Zn, Sr, Zr, Pb) on leaves increased in turn on autumn, summer and spring. It suggested that atmospheric particulate matter accumulated on leaves as time passed. The weight percentile of elements of road, brake wear and vehicle emission dust were nearly equal to those of particles on leaves in all seasons and at all locations. Thought automobile NO_x and PM act isn't applied to Kyoto City, there was no significant difference in chemical profiles between the results in Osaka City and Kyoto City,. The traffic volume and mass of elements had the positive correlation. Especially the amounts of the particles on leaves were strongly correlated with the large size car traffic volumes. These results suggested that biomonitoring technique is the effective method to assess roadside air pollution.