

PM₁₀ spatial distribution and metals speciation study in the Bilbao metropolitan area during the 2017–2018 period

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Abstract

Speciation of respirable particles is becoming increasingly important from an epidemiological and analytical point of view to determine the potential effects of air pollution on human health. For this reason, current laws and analytical sampling methods focus on particle size, as it turns out to be the main factor for the greater or lesser penetration into the airways. In this sense, particles of less than 10 µm in diameter (<10 µm), referred to as PM₁₀, are the particles that have a higher capacity for access to the respiratory tract and, therefore, more significant effect on them. In this sense, one of the most important factors that have a key role in the PM₁₀ atmospheric pollution effect is the dispersion effect with the direct influence of natural effects such as wind, rain, topography apart from others. In this work, PM₁₀ data extracted from the Basque Government environmental stations (19 sampling points) in the Biscay province (Basque Country, north of Spain) were combined with the results obtained from the use of self-made passive samplers (SMPS) in the same sampling points areas and subsequently, the sample analysis with a non-invasive elemental technique (Scanning Electron Microscope coupled to Energy Dispersive X-ray Spectrometry) was carried out. Thanks to this methodology, it was possible to determine a wide variety of metals in PM₁₀ such as Al, Fe, Cr, Ni, Pb, Zn, Ti, etc. Most of them present as oxides and others as part of natural aggregations such as quartz, aluminosilicates, phosphates etc.

Keywords: PM₁₀; Dispersion process; Particulate matter transportation; Self-made passive sampler; Hazardous elements; SEM-EDS