

Characterization of aerosol particles from Buenos Aires City and its subway system: PIXE and SEM/EDX

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Abstract. This study analyzes total suspended particle (TSP) samples collected at two sites of Buenos Aires City (34S, 58W). One site (San Martín) placed 17 km from city center, and the other one at an underground subway station (Diagonal Norte) in downtown Buenos Aires. In both cases, gravimetric analysis has been performed, while elemental analysis using PIXE has been only carried out in the first case. To the best of our knowledge, this is the first airborne particle measurement performed at a Buenos Aires underground subway station.

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There is an increasing concern about the hazardous effects of metals and metalloids in airborne particles on humans and other living organisms in populated areas. These populations are exposed to elements that often are well above natural background. TSP samples were collected at suburb (San Martín) and at subway station Diagonal Norte in downtown Buenos Aires. Metals and non-metals (S, Cl, Ca, Ti, V, Cr, Mn, Fe, Cu, Zn, Pb) were analyzed, in samples collected at San Martín, by conventional PIXE and μ PIXE using ^{16}O at 50 MeV energy and high resolution Si(Li) detectors. Same samples collected at Diagonal Norte were studied using SEM/EDX. Figure 1 shows the TSP average concentrations measured in this study and for comparisons it also includes measurements obtained from other

authors [1]. Clearly, TSP levels measured in the subway station are a factor 4 to 9 times bigger than the ones measured in other urban places. SEM/EDX analysis (not shown) performed on TSP samples collected at subway station, revealed the presence of Fe-rich and Si/Fe-rich particles, which might be attributed to erosion of the wheel-rail interface. Elemental maps obtained by μ PIXE reveal the presence of Ti-rich particles, particles composed mainly by Ca/S or by Fe/Ca/Si, among others. These particles are related to weathering construction materials [2]. The PIXE bulk analysis showed the presence of several constituent elements of suspended particles. Table 1 shows the mean concentrations measured. Elements such as Zn, Cu and Pb are related to vehicular emission, while the others are associated to different sources (natural or anthropogenic sources).

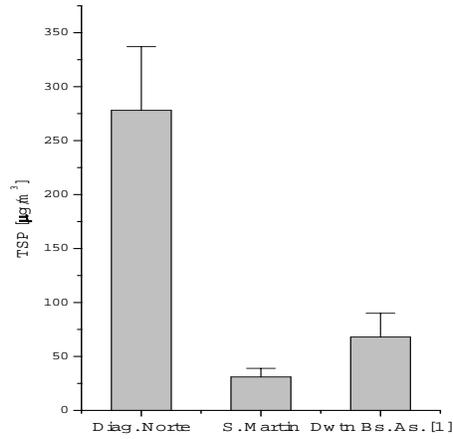


Fig. 1. TSP measurements at several places of Buenos Aires and its subway system.

	mass	Ti	V	Cr	Mn	Fe	Cu	Zn	Pb	S	Cl	Ca
mean	31	13	7	5	4	446	13	36	58	508	1872	895
SD	8	6	4	3	2	400	10	35	22	350	1902	545

Table 1. Mean elemental (ng/m^3) and mass ($\mu\text{g}/\text{m}^3$) concentrations measured at San Martín, SD. Standard Deviation.

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