

Characterization of Individual Particles in Air Quality Program with Sem-Eds

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In major cities worldwide air pollution is a constant that is a big problem to solve. Of all the pollutants commonly found in the atmosphere, the suspended particles are one of the objects of study that attract our attention because of the complexity and variety of the same, especially those known as PM_{2.5}, also known as respirable fraction. [2]

In recent years, research efforts have focused primarily on the PM_{2.5} fraction, and found that a typical sample of this fraction may contain, in addition to the elemental and organic carbon associated with vehicle emissions from the city's traffic, other miscellaneous types of compounds, such as sulfates, mainly calcium and ammonium; chlorides, especially sodium; nitrates, mainly ammonium; biological materials and various other organic compounds. Particulate matter of aerodynamic diameter less than 2.5 μm (PM_{2.5}), has been found to be associated with urban health problems. Many epidemiological studies show that atmospheric aerosols may produce adverse health effects, with recent studies revealing that coarser atmospheric particles are more related to respiratory diseases, whereas the finest particles seem to affect the cardio-vascular system. [3]

Characterization of aerosol samples at the level of individual particles, using micro-analytical techniques, generally permits to obtain more unambiguous and detailed information than bulk analysis, and so it simplifies recognition of the sources of pollution and their processes. [1]

The City of Hermosillo is located between latitude 20 ° 01' 00 "and 20 ° 08' 30" north latitude and between the meridian 110 ° 54' 30 "and 111 ° 01' 00" west longitude at an altitude of 200 m above sea level; is the state's capital, located to the Center-West of the coastal plain, in the Northwest region of Mexico

This work is based on samplings collected of the monitoring station of the Air Quality Improvement Municipal Program in the downtown area for the City of Hermosillo with the sampler Thermo Scientific FH 62 C-14

The samples were analyzed using a scanning electron microscope JEOL JSM 5800-LV model coupled to a system of energy dispersive x-ray (EDS) EDAX DX prime brand with a lower detection limit per element of less than 0.1%.

A section of about 1 cm² of the tape sample was cut into a circular shape and was placed in an aluminum sample holder by a strip of double-sided copper; were coated with a thin platinum film with thickness of approximately 100 Å and placed into the SEM to determine the chemical composition and morphology of particles at the individual level.

Based on EDS results, these particulate matter was primarily composed of Fe (w% 21.74), Si (w% 10.57), Ba (w%3.86), and Al (w%2.66). (**Fig. 1**). The structure of particles can be diverse and they usually present a two dimensional aspect. It is often found that such particles have a irregular morphology, spheroidal, outlying edges and fracture lines.

Related to the chemical composition and morphology, the analyzed particles were classified into the most abundant groups such as soot, Si-rich particles, sulfates, metal-rich particles. **Table 1**

The most of silica particles (probably Si oxides) and aluminosilicates (containing Al, Si, K, Fe and Ca) have irregular forms and come from soil.

References

- [1] Ramirez-Leal, R., et al. (2009) Elemental Chemical Composition, Size and Morphological Characterization of Individual Atmospheric Particles within an Air Quality Program. *Microscopy and Microanalysis*, 15, 1300-1301.
- [2] Ramirez-Leal, R., Esparza-Ponce, H and Duarte-Moller, A. 2007. Characterization of inorganic atmospheric particles in air quality program with SEM, TEM and XAS. *Revista Mexicana de Fisica* 53(3): 102-107.
- [3] Ramirez-Leal, R., Valle-Martinez, M. and Cruz-Campas, M. (2014) Physico-Chemical Characterization of Total Suspended Particles (TSP) Analysis by SEM-EDS. *International Journal of Advanced Research*, 2, 815-817.

Particle Type	Groups	Sub-Groups	Morphology
a) Litophilic source	Oxides of silice-aluminium	Al, Si, Mn, K	Irregular
b) Industrial	Metal Rich	Bi, Fe and Pb	Spheroidal
c) Resuspended	Oxides of silice-aluminium	Al, Si, K, Na, Pb and Ca	Irregular and fracture lines

Table 1.- Classification main Sem-Eds of PM2.5

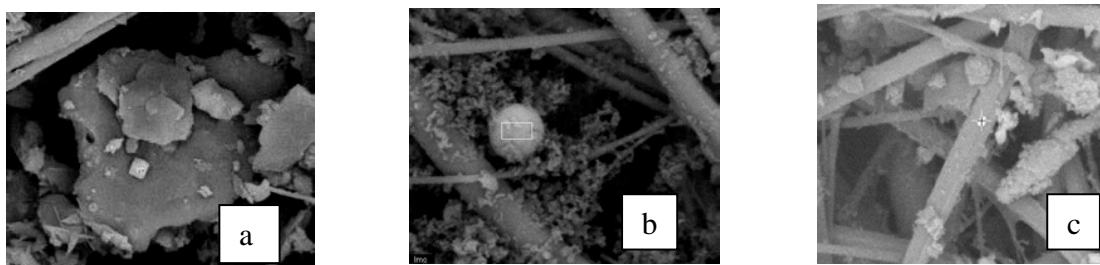


Fig. 1 Particle Type: a) Litophilic source, b) Industrial, c) Resuspended