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MORPHO-PARAMETRIC CLASSIFICATION OF THE INHALABLE FRACTION OF AEROSOLS IN THE INDOOR AND OUTDOOR AIR FROM A UNIVERSITY GYMNASIUM

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Particulate matter (PM) has been associated with increased cardiopulmonary morbidity and mortality. However, this type of studies has been prioritized to open atmospheric scenarios and associated sources to a great extent. This contrasts with the time we spend indoor -either in domestic or working environments-, which far exceeds that of outdoors. Thus, there is a need to assess the health risks of the occupational exposure of the population to fine particle matter. Based on this, the World Health Organization already recommended a set of specific guidelines for indoor air quality (WHO, 2006).

As part of a major study to investigate the indoor air quality in sport facilities at the University of León (Spain), intensive aerosol measurements were made in a gymnasium for several consecutive days in July 2012 (Alves et al., 2014). Daily PM_{10} samples were collected during the period of maximum activity, onto nucleopore polycarbonate (PC) filters, to be investigated by microscopy means. The particles were deposited on a total of 6 indoor and 3 outdoor samples, and analyzed with a field-emission scanning electron microscope (Jeol JSM 6335F) equipped with an Energy-Dispersive X-ray Spectrometer (EDS, Oxford Instruments, X-Max model).

Size, morphological parameters and elemental composition from the individual particles were obtained. Thanks to this information, particles were classified through a set of parametric rules, into 6 different clusters: (1) mineral dust, (2) primary biogenic organic aerosols (PBOA), (3) other organic compounds, (3) inorganic salts, (4) soot and (5) miscellaneous (non-classified particles).

Mineral dust and PBOA dominated the coarser fraction (1-10 µm) of the PM in this study, with mean diameters between 1 and 3 µm, varying form sample to sample. Soot, inorganic salts, and other organic compounds made more than 90% of particle population of the submicrometric aerosol population, with mean diameters around 100-200 nm. This result was consistent with other measurements in the study (Castro et al., 2015). Comparison of these results between the outdoor and indoor samples allowed discerning the PM fraction and characteristics directly attributable to the sport activities from those coming from outdoors. These percentages varied from sample to sample but they were all dominated by magnesium oxides from the use as an efficient moisture hand absorbent, inorganic salts, and organic debris as a result of disintegration of the mattresses that covered the gym floor.

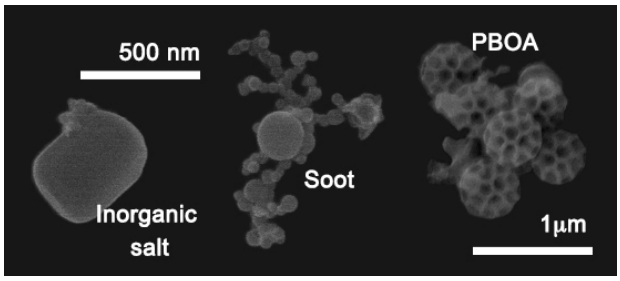

Fig. 1. Examples of some of the particles in the groups.

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