

# Physicochemical Characterization And Sources Of The Thoracic Fraction Of Road Dust In A Latin American Megacity

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## Abstract

Road dust has been identified as one of the main sources of outdoor PM<sub>10</sub> in Bogota (a Latin American megacity), but there are no studies that have analyzed the physicochemical characteristics and origins of its respirable fraction. A characterization of inorganic compounds (water soluble ions, major and trace elements, organic and elemental carbon) and an analysis of source contributions to the PM<sub>10</sub> fraction of road dust were carried out in this study. A total of twenty road dust samples, selected from representative industrial, residential and commercial areas, were swept and resuspended to obtain the thoracic fraction. Size distribution by laser diffraction and individual particle morphology by Scanning Electron Microscopy were also evaluated. The data obtained revealed that the volume (%) of thoracic particles was higher in samples from industrial zones where heavy vehicular traffic, industrial emissions and deteriorated pavements predominated. Crustal elements were the most abundant species, accounting for 49–62% of the thoracic mass, followed by OC (13–29%), water-soluble ions (1.4–3.8%), EC (0.8–1.9%) and trace elements (0.2–0.5%). The Coefficient of Divergence was obtained to identify the spatial variability of the samples. A source apportionment analysis was carried out considering the variability of chemical profiles, enrichment factors and ratios of Fe/Al, K/Al, Ca/Al, Ti/Al, Cu/Sb, Zn/Sb, OC/TC and OC/EC. By means of a PCA analysis, five components were identified, including local soils and pavement erosion (63%), construction and demolition activities (13%), industrial emissions (6%), brake wear (5%) and tailpipe emissions (4%). These components accounted for 91% of the total variance. The results provide data to understand better one of the main sources of PM<sub>10</sub> emissions in Bogota, such as road dust. These data will be useful to optimize environmental policies, and they may be used in future studies of human health and air quality modeling

## Keywords

Bogota; Chemical Composition; Non-Exhaust Emissions; PM<sub>10</sub>; Resuspension;  
SEM.