ARSENIC, CADMIUM, COPPER AND LEAD IN ATMOSPHERIC PARTICULATE MATTER IN THE CENTRAL REGION OF SÃO PAULO STATE, BRAZIL

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Trace elements in urban particulate matter have been of concern to the environmental agencies worldwide because of their direct adverse effects on the waters, ecosystems, and also on human health. Metals/metalloids such as arsenic, cadmium, copper and lead are of particular concern because of their prevalence, persistence in the environment and potential chronic toxicity. A total of ten sets of particulate samples, each in a 7 day period, were obtained in both dry and humid period, in Araraquara city. The region is one of the most important sugar cane harvested in São Paulo State, Brazil. A 12-stage micro-orifice uniform deposit impactor (MOUDI) was used to collect particulate matter (PM). Polycarbonate filter substrates were used on all stages, and at a flow rate of 28.0 l min-1 the 50% cut off diameters (D50) were (mm) 18.6, 10.2, 6.4, 3.2, 1.9, 1.0, 0.58, 0.33, 0.19, 0.1 and 0.063. The filters and samples were weighted on a microbalance that was readable to 1 mg. The sample masses of size fractions PM6.4-10.2, PM3.2-6.4 and PM0.33-0.58 accounted for 10-18%, 13-20% and 12-32% of the total, respectively. Samples were digested in HNO3:HCl 3:1, and further analyzed by ICP-MS. The experimental protocol used in this study was validated using standard reference material (NIST 1648a). The medium concentration in dry and humid period were respectively (ng m-3): As(1.57, 0.44), Cd (1.20, 0.79), Cu (4.96, 2.57) and Pb (3.67, 2.12). Seasonal variation showed higher values of trace elements for samples collected in the dry period. That variation represents the impact of meteorological conditions, which can change the concentration level of aerosol and its chemical composition by aerosol transport. In order to evaluate the medium concentration in the dry period, the 12-stage was organized in (μm): PM>10.0, PM10.0-2.0, PM<2.0. The element concentrations for those categories were (ng m-3): As (0.77, 0.18, 0.68), Cd (0.26, 0.21, 0.73) Cu (0.57, 1,94, 2,45) and Pb (0.19, 0.76, 2.71). In general, PM<2.0 yielded higher concentrations for these elements, except for As. It is well known that fine particles are usually formed by combustion or gas-to-particle conversions and can be rich in toxic metals/metalloids, as well as sulphate, ammonium and nitrate ions. The measured distributions are believed to result from a combination of processes including local anthropogenic and natural sources, long-range transport and resuspension.

Keywords: particulate matter, trace elements, ICP-MS