

Tracking Lead in environmental media in a typical African City: case study of Onitsha, Southeast Nigeria

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The deleterious enrichment of lead in rapidly expanding urban environment has been known to be largely caused by industrial and anthropogenic activities however very few studies had emanated from sub-Sahara Africa as a whole in spite of the increased rate of industrialization and urbanization

One hundred and sixty two samples (120 top and subsoils) and 42 (stream and side drain sediments) were collected from the city of Onitsha; the commercial heartland of Southeast Nigeria to identify the main sources and fate of Pb in soil and sediments using Pb isotopes. The samples were for Pb concentration. 30 samples of 15g of clay fraction of soils and sediments as well as a sample each of galena, coal, vehicle exhaust and battery cell from the region were analysed for lead isotopes of (Pb204, Pb206, Pb207 and Pb208) using ultra trace Inductively Coupled Plasma-emission spectrometry (ICP-MS).

From the results of total Pb ranged 7.2 – 2026 ppm. Soils (range of values) had larger values of Pb than sediments (range of values). Top soil and sub soils showed remarkable variation in Pb concentration, with higher concentration found in the top soil (7.2-1730.5, mean 167.99 ± 292.80 ppm) compare with the sub soils (6.4- 2026.4 ppm, mean 98.66 ± 335.72 ppm). The evaluated ratios of $206\text{Pb}/204\text{Pb}$ revealed identical pattern for both soil and sediment, (17.63 and 17.42); for vehicle exhaust (18.9) as against galena (20.30). Similarly, the ratio of $208\text{Pb}/204\text{Pb}$ exhibited variation in signatures among the samples with soil (35.70); sediments (35.24); vehicle exhaust (36.3) while galena is 39.22. The ratios of $206\text{Pb}/204\text{Pb}$ vs $207\text{Pb}/204$; $207\text{Pb}/204\text{Pb}$ vs $206\text{Pb}/204\text{Pb}$; $208\text{Pb}/207\text{Pb}$ vs $208\text{Pb}/206\text{Pb}$ and $206\text{Pb}/204\text{Pb}$ vs $208\text{Pb}/204\text{Pb}$ in the soils and sediment analysed exhibited relatively near linear relationship on the basis of the land use pattern except for those of galena ore, coal and vehicle exhaust, indicating that the Pb pollution in the study area may have been from multiple anthropogenic sources, including industrial Pb from gasoline, expended paint materials and discarded battery cells

Keywords: Lead Isotope. Anthropogenic. Onitsha.