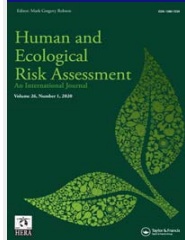


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Chemical speciation and health risks of airborne heavy metals around an industrial community in Nigeria

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Abstract

Quantification of PM_{2.5} (particulate matter <2.5 μm) bound heavy metals and their potential health risks were carried out around a cement manufacturing company in Ewekoro, Nigeria. The PM_{2.5} samples were collected using Environtech gravimetric sampler. A four-staged sequential extraction procedure was used to fractionate PM_{2.5} bound chromium (Cr), lead (Pb), aluminum (Al), copper (Cu), and silver (Ag), and further analyzed using inductively coupled plasma mass spectrometry. Chemical speciation results reveal bioavailable levels of Pb (4.05 μg/m³), Cr (10.75 μg/m³), Al (16.47 μg/m³), Cu (4.38E-01 μg/m³), and Ag (1.22E-02 μg/m³) in the airborne particulates. Pb and Cr levels exceeded the World Health Organization allowable limit of 0.5 and 2.5E-05 μg/m³, respectively. The labile phases showed strong indication of the presence of Cr and Cu metal. Excess cancer risks exposure for adults, outdoor workers and children were higher than the acceptable risk target level of 1E-06. Non-carcinogenic health risk estimated using hazard quotients (HQs) and hazard indices (HIs) showed ingestion route within the safe level of HI <1 implying no adverse effect while inhalation route exceeded the safe level for all receptors. Enforcement of pollution control by authorized agencies, and screening of greenbelts as sinks for air pollutants is strongly recommended.

Keywords:

[air pollution](#)[PM_{2.5}](#)[heavy metals](#)[sequential extraction method](#)[health risk assessment](#)

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Disclosure statement

No potential conflict of interest was reported by the authors.

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