Determination of Copper and Lead in Water Samples from Zamfara State, Nigeria by Linear Sweep Anodic Stripping Voltammetry

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doi: 10.20964/2016.10.06

Received: 9 March 2016 / Accepted: 25 July 2016 / Published: 6 September 2016

In June 2010, there was a report of a major outbreak of lead poisoning leading to several hundred deaths especially of women and children below five years of age in some parts of Zamfara State, Nigeria. The poisoning was reported to be related to gold mining operations in areas where lead is present in the ores. Medicins Sans Frontiers had reported that lead was implicated in the mortality. The levels of lead and copper in drinking water samples collected from wells, boreholes, stream and ponds in some of the affected areas were determined by linear sweep anodic stripping voltammetry (LSASV), using glassy carbon as working electrode, Ag/AgCl as reference and platinum as the auxiliary electrode. The pre-concentration of lead or copper in the samples was carried out electrolytically. Voltammetric peaks for lead and copper were observed at -495 mV and -19.4mV respectively. The concentrations of lead and copper in the water samples were in the range of 118.46 µg/L–6879.09 µg/L and 61.62 µg/L–1340.18 µg/L respectively. These results are far above the WHO maximum permissible limits in potable water. Other physico-chemical parameters determined include pH, total dissolved solids (TDS), electrical conductivity (EC), temperature, acidity, alkalinity and hardness. The results indicate that in addition to lead poisoning, copper poisoning may have contributed to the mass mortality in the areas.

Keywords: Heavy metal pollution, mining operations, voltammetry, water.

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