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Determination of Polycyclic Aromatic Hydrocarbons in Rivers, Sediments and Wastewater Effluents in Vhembe District of South Africa Using GC-TOF-MS

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Abstract : Polycyclic aromatic hydrocarbons (PAHs) are very toxic and persistent environmental contaminants. This study was undertaken to assess the concentrations and possible sources of 16 PAHs classified by the United State Environmental Protection Agency as priority pollutants in Mvudi and Nzhelele Rivers and sediments. Effluents from Thohoyandou wastewater treatment plant and Siloam waste stabilization ponds were also investigated. Diagnostic ratios were used to evaluate the possible sources of PAHs. PAHs in the water samples were extracted using 1:1 dichloromethane and n-hexane mixtures, while those in the sediment samples were extracted with 1:1 acetone and dichloromethane using ultrasonication method. The extracts were purified using SPE technique and reconstituted in n-hexane before analyses with GC-TOF-MS. The results obtained indicate the prevalence of high molecular weight PAHs in all the samples. PAHs concentrations in water and sediment samples from all the sampling sites were in the range of 13.174-26.382 mg/L and 27.10-55.93 mg/kg, respectively. Combustion of biomass was identified as the major possible source of PAHs. Effluents from wastewater treatment facilities were also considered as major anthropogenic contributions to the levels of PAHs determined in both river waters and sediments. Mvudi and Nzhelele Rivers show moderate to high contamination level of PAHs.

Keywords : polycyclic aromatic hydrocarbon, rivers, sediments, wastewater effluents
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