**Determination and Distribution of Polycyclic Aromatic Hydrocarbons in rivers, sediments and wastewater effluents in Vhembe District, South Africa**

JOSHUA N. EDOKPAYI 1, JOHN O. ODIYO 1, TITUS A.M. MSAGATI 2 and ELIZABETH O. POPOOLA3

1 Department of Hydrology and Water Resources, University of Venda, Private Bag X5050, Thohoyandou 0950, South Africa; E-Mails: [Joshua.edokpayi@univen.ac.za](mailto:Joshua.edokpayi@univen.ac.za); john.odiyo@univen.ac.za

2 College of Science, Engineering and Technology, Nanotechnology and Water Sustainability Research Unit, Florida Science Campus, University of South Africa, Roodepoort 1710, Johannesburg, South Africa; E-Mail: msagatam@unisa.ac.za

3 Department of Chemical Sciences, Yaba College of Technology, P. M. B. 2011 Yaba, Lagos Nigeria; E-Mail: seunliz27@yahoo.com

Abstract

Polycyclic aromatic hydrocarbons (PAHs) are very toxic and persistence environmental contaminants both to humans and other living organisms. This study was undertaken to assess the concentrations and possible sources of 16 PAHs classified by the United State Environmental Protection Agency (US EPA) 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 the ultrasonication method. The extracts were purified using SPE technique and reconstituted in n-hexane before analysis with GC x GC x TOFMS. The results obtained indicate the prevalence of high molecular weight PAHs in all the samples. The 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 linked as the major possible source of PAHs. The effluents from the wastewater treatment facilities was also considered as a major anthropogenic contribution to the levels of PAHs determined in both river waters and sediments. Mvudi and Nzhelele Rivers shows moderate to high contamination level of PAHs.

Keywords: Contamination diagnostic ratio, polycyclic aromatic hydrocarbons, river, sediments, wastewater