Levels of selected alkylphenol ethoxylates (APEs) in water and sediment samples from the Jukskei River catchment area in Gauteng, South Africa

Linda L Sibali[1,2]*, Jonathan O Okwonkwo[3] and Rob I McCrindle[4]

[1]Chemistry Section, Analytical Services, Rand Water, Vereeniging, 1930, South Africa

[2]Coca Chemicals and Consulting, PO Box 10898, Vorna Valley, Midrand, 1686, South Africa

[3]Department of Environmental, Water and Earth Sciences, Tshwane University of Technology, Tshwane 0001, South Africa

[4]Department of Chemistry, Faculty of Science, Tshwane University of Technology, Tshwane 0001, South Africa

Abstract

There has been a continual search to develop sensitive analytical methods for detecting and determining organic compounds such as alkylphenol ethoxylates (APEs) in environmental samples, since they occur at very low concentration levels. Studies conducted so far in some South African waters have offered little or no information on APEs. The presence of these compounds in environmental samples is not desirable and therefore, needs to be monitored. Water and sediment samples were collected from different sites in the Jukskei River catchment area in the 2005 summer and winter seasons. Liquid-liquid extraction (LLE) and Soxhlet extraction (SE) methods (using 1:1 dichloromethane and methanol as extracting solvents) were optimised, evaluated and used to determine APEs of interest in water (unfiltered and filtered) and sediment samples, respectively. Mean percentage recoveries obtained for APEs in spiked double-distilled water were between 83.1±1.0 (OPnEOS3) and 108.1±3.5 (OP) and for sediments the range was between 96.6±0.9 (OPnEOS1) and 117.1±0.6 (OPnEOS3). The concentration levels of APEs studied in unfiltered environmental water samples were in the range of 0.25(0.03) ng/mℓ (NP) to 92.7(1.11) ng/mℓ (OPnEOS3) and 0.31(0.02) ng/mℓ (NP) to 60.1(0.51) ng/mℓ (OPnEOS3) for filtered environmental water samples. Concentration levels obtained in sediments were from 1.94(0.14) ng/gdw to 941(0.50) ng/gdw (OPnEOS3). Analytes adsorbed on the sample bottle gave concentration levels which ranged from 0.02(0.02) ng/mℓ to 0.42(0.02) ng/mℓ for APEs. All the compounds studied were found at levels higher than the European Union (EU) set levels for the protection of the aquatic environment.

Keywords: APEs, surface water, sediments, liquid-liquid, soxhlet, GC-FID