E2-40 Investigation of heavy metal ion contamination in the waterways of Colombo, and the speciation of the copper contaminant into free and bound forms

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Heavy metal ion contamination is of special concern, due to hazards to human health. In recent years, it has become increasingly evident that toxicity of a metal ion is significantly affected by its chemical state. This work was directed towards quantification of total cadmium, chromium, copper, lead and zinc in the surface water of Beira lake, Lunawa lagoon, and Hamilton canal, by AAS (graphite furnace) and the speciation of copper into the free and bound forms. A sedimentation analysis was also performed for the 5 metal ions. Total copper concentration was determined by both Atomic Absorption Spectrometry (graphite furnace) and Differential Pulse Anodic Stripping Voltametry (DPASV). The speciation of copper was performed by the ligand exchange technique using DPCSV with catechol as the foreign ligand.

Table 1: Metal ion concentration range* obtained for a 5 month period**

Water body***	Cd (ppb)	Cu (ppb)	Cr (ppb)	Pb (ppb)	Zn (ppb)
Beira lake	0.2-28.4	18.0-95.2	12.5-92.0	<0.25-8.0	<0.05-3.9
Lunawa lagoon	0.2-19.7	4.6-59.6	13.0-61.0	<0.25-8.5	<0.05-3.1
Hamilton canal	1.6-25.5	10.0-31.5	21.5-48.0	<0.25-1.6	0.05-1.74

* The highest and lowest values over a 5 month period
** In the months March - July 1996, sampling performed monthly
*** 3 sites in the Beira lake, 5 sites in the Lunawa lagoon, and 2 sites in the Hamilton canal were sampled.

The heavy metal ion contamination in the surface water of Beira lake, Lunawa lagoon, and Hamilton canal (Table 1) was generally lower than the CEA limit for industrial waste water. Sedimentation analysis in general revealed a higher level of contamination than surface water, highlighting the importance of this method of analysis. A comparative analysis of copper by AAS and DPASV revealed that while both methods gave similar results (at metal ion concentrations in the ppb level), the DPASV method was preferred due to the higher precision of the method, and shorter analysis time. Speciation of copper using the ligand exchange technique revealed a sharp variation in the ratio of free copper to bound copper, in the 5 month period. In general, this ratio was inversely correlated with pH.