

TRACE METAL DISTRIBUTION IN URBAN EFFLUENTS OF MYTILENE: RESULTS FROM A FIVE YEARS MONITORING PROGRAM

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EXTENDED ABSTRACT

Trace metal concentrations along with physicochemical parameters were determined in urban effluents from the town of Mytilene over a five-year period (1996-2001). The study was part of the MEDPOL monitoring program for the assessment of urban effluent quality and importance as potential contamination source for the marine coastal environment. During the sampling period residential effluents and the town surface runoff, were discharged untreated to the sea through a number of sewage outfalls along the coastline. The studied physicochemical parameters were: wastewater temperature, dissolved oxygen (DO), total suspended solids (TSS), biological oxygen demand (BOD₅) and chemical oxygen demand (COD), whilst the determined trace metals were Cd, Cu, Pb and Zn in dissolved and particulate phase.

Temperature values and dissolved oxygen concentrations showed seasonal variability. The dissolved oxygen concentrations ranged from 0.1 to 8.8 mg/l and the higher values were observed during winter months. BOD₅ and COD ranged from 18 to 245 mg/l (median 70 mg/l) and from 54 to 827 mg/l (median 260 mg/l) respectively. TSS values ranged from 20 to 700 mg/l (median 110 mg/l), with the exception of two high values (1222 and 1640 mg/l), which were observed during constructive works in the sewerage network. Dissolved metals concentration ranges were: 0.10 to 10.54 µg/l for Cd, 1.63 to 109.90 µg/l for Cu, 0.50 to 85.38 µg/l for Pb and 10 to 6245 µg/l for Zn. The concentration ranges for particulate metals (on an effluent volume basis) were: 0.07 to 0.65 µg/l for Cd, 5.70 to 60.16 µg/l for Cu, 2.30 to 47.30 µg/l for Pb and 22 to 433 µg/l for Zn. In the suspended solids the metal concentrations were: 0.33 to 4.32 µg/g Cd, 50.2 to 393.5 µg/g Cu, 19.2 to 159 µg/g Pb and 274.2 to 3499 µg/g Zn.

The partition coefficients (expressed as $\log K_d$) between dissolved and particulate phase were 3.7 for Cd, 4.4 for Cu, 4.1 for Pb and 3.8 for Zn. $\log K_d$ values for metals in untreated urban effluents were not found in the literature, but comparison with relative values in freshwater media showed that calculated $\log K_d$ s were within the range reported for natural media.

The 'Particle concentration effect' was manifested for Cd, Cu and Zn but not for Pb, and was attributed to the abundance of colloidal organic matter in the effluents.

Key words: urban effluents, physicochemical parameters, total suspended solids (TSS), dissolved and particulate trace metals, partition coefficient, 'particle concentration effect'.