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DETERMINATION, INTERPRETATION AND MODELING OF CHLORINATION BY-PRODUCTS CONCENTRATIONS IN SURFACE WATERS

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EXTENDED ABSTRACT

Bench-scale chlorination experiments have been conducted in surface waters from different sources in Mytilene island, Greece, in order to investigate the formation of chlorination by-products (CBPs). The main factors studied were organic matter content of water (expressed as UV-272 absorbance), time and chlorine dose.

The CBPs, determined by gas chromatographic techniques, belong to the categories of trihalomethanes (THMs), haloacetic acids (HAAs), haloacetonitriles, chloral hydrate and chloropicrin. HAAs and THMs were the most abundant CBPs detected in the chlorinated samples, while haloketones, haloacetonitriles and chloral hydrate occurred at much lower concentrations.

Different speciation of CBPs was observed in regard to the water quality characteristics. Increase in chlorine dose resulted in formation of higher concentrations of CBPs in all cases. However, the influence of reaction time was different on different categories of CBPs, with longer reaction time resulting in higher concentrations of THMs and HAAs, but in lower concentrations of haloketones and haloacetonitriles.

Statistical analysis of the results with multifactor analysis of variance (MANOVA) revealed the influence of the parameters studied on the formation of individual compounds. Application of principal component analysis (PCA) provided a clear picture of the differentiations between varying water sources and chlorination conditions. Multiple regression was used for development of predictive models for CBPs formation. The proposed models are considered satisfactory for prediction of CBPs concentrations for water sources and chlorination conditions similar to those examined.

Key words: chlorination by-products, multifactor analysis of variance, principal component analysis, multiple regression models