

Development and validation of a method for the quantification of tributyltin at subnanogram per liter concentrations

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Tributyltin (TBT) as a compound in antifouling agents is used to protect ship hulks. This causes an increase of its concentration in sediments and surface water, especially in harbours. The toxic tributyltin species decreases the number of males in fish populations due to their estrogenic activity to organisms. Organotin compounds were taken into consideration in new federal law concerning protection of soil and sewage sludge. In European directive related to the water contamination, the acceptable tributyltin concentration is very low and about 0.2 ng/l. So the determination of trace impurities concerning TBT in water requires a very sensitive technique like GC-ICP-MS, but basically common or traditionally analytical methods do not permit the measurement of this organotin species in environmental matrices.

A preliminary step has to be developed for the separation of TBT from the samples mentioned above. In addition the ultra-trace amount of TBT has to be concentrated so that the limit of detection of the measurement techniques can be efficiently lowered. Tributyltin preconcentration procedures, like solid phase extraction (SPE) using various column packings like octyl or octadecyl reversed phase materials should be established. Optimized adsorption and elution profiles for suitable recovery rates have to be developed and validated as well as a further concentration step using solid phase microextraction (SPME). For the accurate quantification of the preconcentrated TBT samples suitable derivatisation procedures were investigated using different types of alkylation reagents. The detection of these alkylated TBT species were carried out by using a GC-AED. Standard addition procedures using triple-distilled water and tributyltin standards are elucidated as well as real samples of contaminated water.