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The use of isotope dilution gas chromatography - mass spectrometry for the determination of butyltin species in marine environmental samples

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Toxic organotin compounds (OTC) have been introduced into the marine environment mainly through their use as biocides in antifouling paints for vessels. Among them trisubstituted organotin compounds (e.g. tributyl tin) exhibits highest toxicity towards aquatic life at very low concentration levels (1 ng Sn L^{-1}). Therefore, reliable and sensitive analytical techniques must be used for the determination of OTC in different environmental samples.

In the present study species specific isotope dilution gas chromatography – mass spectrometry (ID-GC-MS) technique was used for the determination of butyltin species in marine environment samples. Commercially available spike solution containing ^{119}Sn enriched mono-, di- and tributyltin was used. The analytical methods applied consisted of ultrasonic extraction, followed by derivatisation with sodium tetraethyl borate, extraction into iso-octane and determination by GC-MS. For the measurement of isotope ratios (118/119 and 120/119) the most adequate molecular cluster [M-Et] was selected and simple mathematical equations for corrections of ^{13}C contribution to measurement signals were adopted from the literature. Methods were validated by the analyses of reference materials (PACS-2 harbour sediment and ERM-CE 477 mussel tissue) and by spiking uncontaminated sea water sample. Good agreement between determined and certified values was obtained.
Finally, ID GC-MS was used for the determination of butyltins in sea-water, marine sediments and mussels from the Northern part of the Adriatic Sea. Among butyltins, tributyltin was the predominant species in all samples analysed.