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COMPARISON OF ANALYTICAL METHODS BASED ON SPE AND SPME TECHNIQUES FOR THE DETERMINATION OF ANTIFOULING BOOSTER BIOCIDES IN NATURAL WATERS.

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ABSTRACT

The comparison of analytical procedures, based on solid phase extraction (SPE) and solid phase microextraction (SPME) techniques, for the determination of five organic booster biocides (Irgarol, Dichlofluanid, Chlorothalonil, Folpet, SeaNine 211/Kathon), which are used in marine antifouling paints, is described. Analysis was performed with SDB (styrene-polydivinylbenzene), C18 (octadecyl-silica) and AC (activated carbon) disks used in off-line SPE procedure as well as PDMS (polydimethylsiloxane) and PA (polyacrylate) coating fibres used for the SPME technique, coupled with gas chromatography with electron capture, flame thermionic and mass spectrometric detection. Recovery studies were performed at 0.5-10 μg/l concentration level in spiking water samples of different origin (distilled, lake, river and sea water) after optimization of each technique. Irgarol, Sea Nine and chlorothalonil were extracted effectively with C18 and SDB disks (recovery >75%), while dichlofluanid was moderately or insufficiently extracted (recovery $\leq$ 65%). With CB disks carefully extraction procedure is needed for the efficient extraction of dichlofluanid, Sea Nine and Irgarol, while chlorothalonil was difficult to be desorbed (recovery $\leq$60%). In SPME procedure both fibres were capable to extract all biocides showing recoveries in relatively high levels (65-124,4%). SPME can be used more efficiently as a multiresidue technique for the tested biocides than SPE which requires the use of different sorbents for the determination of biocides. Very low limits of detection (1-60 ng/l) can be achieved under the optimized conditions with both SPE and SPME techniques and thus, their potential of trace-level screening determination of antifouling biocides in natural waters is demonstrated.