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해양환경-P10 Levels and patterns of chlorobenzenes in marine sediments and bivalves from the coastal areas of Korea

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1. Introduction

Organochlorine compounds are widely used in the chemical industry either as solvents or intermediates for synthesis. Chlorobenzenes (CBs) in these chemicals have a group of 12 compounds ranging mono- to hexachlorobenzene according to a number and position of chlorine atoms. These compounds are mainly used as deodorants, solvents and pesticides as well as byproducts of manufacturing processes related to agro- or petro-chemical (Newhook and Meek, 1994). Studies on HCB in various environmental compartments such as water, air, soil, birds, fish, human milk, adipose tissue, and blood (Tanabe et al., 1993; Kelly and Campbell, 1994; Hermanson et al., 1997). However, the traditional emphasis in environmental distribution has been only on HCB. In particular, there are few data on level of chlorobenzene compounds available in marine environment of Korea. This investigation is the first effort for chlorobenzene compounds in seawater from Korean marine environment. Therefore, the objective of this work was to investigate levels and patternsof certain chlorobenzenes including HCB in sediments and bivalves from the coastal areas of Korea.

2. Materials and methods

Surface sediments and marine bivalves were sampled from 20 stations in Korean coastal areas. The analytical methods were similar to previous papers (Moon et al., 2001). The compounds of interest include 1,2,3-, 1,2,4- and 1,3,5-isomers of trichlorobenzene (1,2,3-TrCB, 1,2,4-TrCB and 1,3,5-TrCB), 1,2,4,5-, 1,2,3,4- and 1,2,3,5-isomers of tetrachlorobenzene (1,2,4,5-TeCB, 1,2,3,4-TeCB and 1,2,3,5-TeCB), pentachlorobenzene (PeCB) and hexachlorobenzene (HCB). We selected eight isomers ranging from tri- to hexachlorobenzene based on persistent ability to retain them on marine sediment materials, and analyzed them our chromatographic system. This method could not separately quantify the 1,2,3,5- and 1,2,3,4-tetrachlorobenzene and they were therefore quantified together as a compound.

3. Results and discussion

The levels of total chlorobenzenes in sediments from Korean coast ranged from 0.32 to 3.6 ng/g dry weight with a mean 1.6 ng/g dry weight. The Station 6 from Ulsan coast, which were located close to a large number of industrial complex in Kor ea, showed the highest level in sediments. In bivalve samples, the concentrations of total CBs varied between 0.25 to 0.84 ng/g wet weight with a mean 0.49 ng/g wet weight. The highest level was Station 4 from Hupo coast, whereas the lowest was the Station 16 from Jeonjupo coast. HCB levels in sediments and bivalves were slightly or relatively moderate to other countries.

The contribution of total CBs in sediments and bivalves for each station showed similar patterns for all stations. This indicates that CBs contamination in analyzed sediments and bivalves derived from the similar source. In the sediment samples, the predominant contributors were trichlorobenzene groups (59.3±27.9%), whereas tetrachlorobenzenes (7.2±8.6%) and pentachlorobenzene (6.3±3.3%) showed low concentrations. HCB occupied 27.1±13.6% for total CBs. These patterns were comparable to a review by Lee et al. (2000) concerning contributions individual chlorobenzene to sum of chlorobenzene in surficial sediments from Kaohsiung coast, Taiwan. In the bivalves, the predominant contributors were trichlorobenzene groups (51.3±24.0%), whereas tetrachlorobenzenes (12.1±8.4%) and pentachlorobenzene (18.0±10.9%) showed low concentrations. HCB occupied 18.6±9.1% for total CBs.

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