

groups of the persistent organic pollutants (POPs), have been caused extensive concern due to their high toxicity, persistence, bioaccumulation and biomagnification in the environment. OCPs have been widely used throughout the world since the 1950s (especially in China), thus they are ubiquitous in the environmental matrixes and the sediments usually regard as a final sink for the organic pollutants.

In this work, fifty-five surface sediment samples covering virtually the entire Bohai Sea were measured for OCPs to provide a better understanding of the occurrence levels, geographical distribution, possible sources and potential biological risk of these compounds in this area. The results indicate that the Bohai Bay and the area neighboring big harbors in the Bohai Sea had higher levels of DDTs, suggesting that the shipping and port facilities for transportation and fishery could be a local point source for DDTs in the coastal regions. Another possible cause is that the surrounding area of the Bohai Bay was ever an important production base for OCPs (especially HCHs and DDTs) in China. The (DDE+DDD)/DDT ratios indicate that degradation of the parent DDT occurred significantly in the study areas. The historical usage and production, suspended sediments, complicated hydrodynamic conditions and dilution effect could be responsible for the distribution patterns of OCPs. PCA results indicate that the distance to the pollution sources could be more important for the OCPs occurrence. Comparing the current data with sediment qualities guidelines, most of the OCPs in surface sediments from the Bohai Sea were relatively low from an adverse biological aspect, however, DDTs and chlordanes at various coastal sites had some biological risk due to their higher level in the area.

This work was supported by the Natural Science Foundation of China (NSFC) (No: 40776062) and National Basic Research Program of China (973) (Nos. 2002CB422304 and 2005CB422304).

Composition change of organic matter in bottom sediment of the Osaka Bay

Yukio KOMAI^{1*}, Chiaki MATSUSHITA², Koji KADONO³, Yuka OTSUKA⁴ & Koyo YONEBAYASHI⁵

¹Department of Environmental Technology, Institute of Osaka Technology, Omiya 5-16-1, Asahi, Osaka 5358585, Japan

*E-mail: komai@env.oit.ac.jp

²Osaka Prefectural Institute of Environment,

Agriculture and Fishery, Nakamichi 1-3-62, Higashinari, Osaka 5370025, Japan

³Yamaguchi Prefectural Institute of Public Health and Environment, Asada 535, Yamaguchi 7530871, Japan

⁴Ehime Prefectural Institute of Public Health and Environment, Sanbancho 8-234, Matsuyama 7900003, Japan

⁵Department of Environmental Science, Ishikawa Prefectural University, Suematsu 1-308, Nonoichicho, Ishikawa, Ishikawa 9218836, Japan

We studied the composition change of the persistent organic matter, which consist of humin, humic acid, and fulvic acid, in Osaka bay, the Seto Inland Sea, Japan. The bottom sediment was taken in 1985 and 2004, respectively. Humic substances which extracted by sodium-hydrate and sodium pyrophoric acid is named alkali extracted humic substances. The persistent organic matter that is not extracted by the reagent is humin, which is the most persistent in organic matter in bottom sediment. Then, humic acid was precipitated and separated by sulfuric acid. Amount of alkali extracted humic substances and humic acid were shown as total organic carbon (TOC) by TOC analyzer. Amount of hydrogen and oxygen in humic acid extracted were measured by CHNO analyzer after freeze dehydration. The qualitative alteration of humic acid was evaluated by using the relationship between H/C atomic ratio and O/C atomic ratio in humic acid. In addition, nitrogen and oxygen stable isotope ratio, $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$, were analyzed for several samples. These parameters used to presume the origin of persistent organic matter.

The concentrations of TOC in surface bottom sediment significant decreased in 1985 than those in 2004. This demonstrated that total amount control of COD conducted since 1970's have been succeeded and the bottom sediment environment of Osaka bay has been improved. The ratio of alkali extracted substances to TOC decreased. This means that the amount of humin, which is the most persistent in organic matter in bottom sediment, raised relatively in 2004. The ratios of humic acid to alkali extracted humic substances in 2004 were greater than those in 1985, too. These results showed that amount of humin and humic acid, which are more persistent in organic matter, relatively increased in bottom sediment of Osaka bay.

The relationship between H/C atomic ratio and O/C atomic ratio in humic acid showed that the H/C atomic ratio enlarged in 2005. It was suggested that the decreasing of amount of humic acid flowing from land or the increasing of

younger humic acid in bottom sediment. The $\delta^{13}\text{C}$ was -22 ‰ at the station located in the inner area, and the value of $\delta^{15}\text{N}$ was higher than the value of phytoplankton. These results seemed that organic matter in bottom sediment related to organic matter of land origin but not phytoplankton. As the percentages of domestic wastewater treatment in the Osaka bay watershed, which include a regional sewerage system, a joint wastewater treatment, and a sewerage system for rural communities, raised from 30 % in 1970 to 90 % in 2004. A lot of easily decomposable organic matter was treated due to sewerage system process. Therefore, the percentages of persistent organic matter in effluent which flows into Osaka bay would relatively increase. It is not clear about the process of change from water to sediment on humic substances. These results suggest that the change of degradation property of organic matter in water might effect for bottom sediment.