

## Distributions and characteristics of polycyclic aromatic hydrocarbons, styrene oligomers, and alkylphenols in sediments of Ulsan Bay, Korea

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### ABSTRACT

Ulsan Bay is one of the most polluted area in Korea, which was designated as a special management zone in 2000, and it is known that various anthropogenic pollutants are introduced into the bay from surrounding industrial complexes. In the present study, current contamination status of persistent toxic substances (PTSs), such as alkylphenols (APs), styrene oligomers (SOs), and polycyclic aromatic hydrocarbons (PAHs) were evaluated in environmental multimedia samples from the Ulsan Bay. Total of 30 PTSs, including 6 APs, 10 SOs, and 14 PAHs, were analyzed in surface water (dissolved and particulate) and sediments collected from the Ulsan Bay (5 sites) and surrounding inland creeks (4 sites) in June 2017. In order to identify the sources of organic matter (OM) in suspended particulate matter (SPM) and sediments, organic carbon (OC), total nitrogen (TN), and carbon stable isotope ratio ( $\delta^{13}\text{C}$ ) were determined. The results for C/N ratio and  $\delta^{13}\text{C}$  values of POM and sediments indicated that some sites near the land were partly affected by terrestrial organic matter. Concentrations of APs, SOs, and PAHs in surface water were ranged from 1.1 to 120 ng L<sup>-1</sup>, from <DL to 27 ng L<sup>-1</sup>, and from <DL to 7.5 ng L<sup>-1</sup>, respectively. In addition, sedimentary PTSs were ranged from 0.2 to 510 ng g<sup>-1</sup> for APs, from <DL to 2900 ng g<sup>-1</sup> for SOs, and 0.4 to 240 ng g<sup>-1</sup> for PAHs. The detected concentrations of PTSs in water and sediments were generally found to not exceed the existing environmental quality guidelines. Greater concentrations of PTSs in SPM and sediments were found in inner part of the bay than those of outer regions, while dissolved PTSs were comparable among sites. Spatial distributions of PAHs in sediments were generally similar to APs, indicating that those compounds were originated from similar sources. The concentrations of sedimentary PAHs obtained from this study were generally less than those of previous studies conducted in 1990s, while the sedimentary APs concentrations were comparable with those of 20 years ago. Overall, results of the present study on current contamination status of PTSs and multimedia distribution characteristics of the Ulsan Bay, which will provide baseline information for the future monitoring study and coastal management.

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## Development of rare earth elements and neodymium isotope analysis of organic materials in sediments

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### ABSTRACT

The river-sea interfaces, continental margins, are the major source of a number of elements and materials including oxide fraction, organic matter and detrital mass. Organic matter (OM) has an important function on exchange process between the atmosphere, hydrosphere and geosphere and biogeochemical. The OM in natural waters are usually derived from photosynthetic processes. In the river-sea interface systems, a significant fraction of OM in sea water may have a continental origin which delivered via rivers and atmospheric input. Minor fraction of OM can reach the seafloor and undergo early diagenetic processes. The neodymium (Nd) contained in the accumulated OM does not undergo isotopic fractionation and can be a useful tool to see the recorded information at the time of OM formation. Despite the potential importance of OM in hydro-geochemistry, distribution of OM and its Nd isotope have not been actively studied in Korea. In this study, we developed an experimental method to extract OM and separate Nd from Fe-Mn oxides and detrital fraction in sediments. Furthermore, Nd isotope analysis of OM in various river and ocean sediment reference materials are in process. We collected sediment samples from two distinct river-sea interface system. In the Geum River-Yellow Sea interface, sediments were collected from six locations, from the inside of the dam to the outer sea, which is the boundary between river and sea. In the opened Sumjin River-South Sea interface without dams, sediments were collected at five sites from the river to the sea. Its OM extraction and Nd isotope analysis are undergoing. A comparison of these two systems is expected to make a meaningful insight of the behavior of OM.

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