

Environmental Tracers Utilization through Component Analysis and Isotope Analysis of Marine Sediments from Onsan Port, Korea

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Marine sediments have been found to contain residues of TBT, used over the past 40 years in anti-fouling paints for maritime vessels. This study aimed to identify the characteristics of TBT substances in marine sediments and assess their potential as environmental tracers using Sn isotopes. The Sn isotope composition studies have been utilized to gain insights into the geological processes that led to the formation of sediments and to study the characteristics based on isotopic fractionation. Sn isotope analysis is conducted after ion-exchange chromatography preprocessing, using NIST SRM 3161a as a standard material. The element Sb is used for mass bias correction, and isotope analysis is performed using an MC-ICP-MS, employing an empirical regression method. This research focuses on understanding the correlation between the results of the component and isotope analysis of the raw marine sediment material and the extracted organic substances. The samples used in this study were marine sediment samples collected from the port of Onsan, located in the southwestern part of Korea. The collected sediments were processed at Chungnam National University using Dichloromethane (DCM) to extract organic substances. The raw materials, organic substances, and residual materials after extraction were analyzed for their component and Sn isotope composition to identify differences in composition and isotope makeup. The component and isotope analysis of marine sediments and other substances were conducted using Agilent 7900 ICP-MS and Nu Plasma II MC-ICP-MS at KBSI. The analysis of components showed that the raw material contained about 100 mg/kg of Cu and about 200 mg/kg of Zn, while the residual material after extraction contained 50 mg/kg of Cu and 130 mg/kg of Zn, indicating that Cu and Zn were included in the organic extract. However, the content of Sn did not show significant differences, indicating a distinction between organic and inorganic tin. The trends in changes of components and isotopes in the raw material, extracted organic substances, and residual materials can identify characteristics of substances that can be used as environmental tracers for pollution source tracking, and will be useful in determining the target substances for future environmental tracer studies on marine sediments.