

Characteristics of metal pollution and Pb isotopes in sediments from the whole Korean coast

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193 surface sediment samples from the whole Korean coast including harbor inside, special management sea area, environmental preservation sea area and offshores were collected in 2016 not only to study the spatial distribution and pollution assessment of 8 heavy metals (ICP-MS), but also to identify anthropogenic pollutions for Pb isotopes (MC-ICP-MS). Heavy metal concentrations (mg/kg) in sediments were found in the following order: Zn(130.8)>Cr(62.7)>Cu(38.9)>Pb(36.3)>Ni(25.8)>As(9.4)>Cd(0.31)>Hg(0.07). Metals in harbor sediments were 1.3(Cr)~5.5(Cu, Hg) times higher than the other regions. Especially, sediments in Busan harbor which is the largest port in South Korea, showed high concentrations for Cu, Zn, Pb and Hg. Metals except for Cr, Ni in sediments from special management sea area had the second highest concentration. Among them, Cr, Ni, Cu, As, Pb, Hg showed the highest value from Ulsan, whereas Zn and Cd had the highest metal value in Masan. Cr and Ni concentrations at most sampling sites were below the threshold effect level (TEL) of Korean sediment quality guidelines. For other metals, 10.4%(Cd)-30.1%(Zn) of sites exceeded TEL guideline. The high exceedance of probable effect levels (PEL) showed in large harbor and part of the special management sea areas. Assessment of sediment quality index (SQI) in harbor sediments showed that 6 sites were in a “poor” condition. Environmental preservation sea area and offshore sediments were indicative of “good” to “excellent” conditions. For the case of special management sea area, sampling sites near industrial facilities in Ulsan, Masan and Shihwa were in a “poor” to “very poor” conditions. The preliminary isotopic analyses of 193 sediments show ²⁰⁶Pb/²⁰⁷Pb ratio variation from 1.120 to 1.383. The isotopic signature of sediments have difficult to classify the Pb pollution sources due to the different geographical features, land-use types and industry facilities.