



Distribution and Enrichment Evaluation of Heavy Metals in the Sediments of Harbors and Coastal Areas in Korea

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Concentrations of Al, Cr, Ni, Cu, Zn, As, Cd, Pb and Hg in surface and core sediments were determined to investigate the regional trends of heavy metal contamination in 12 coastal areas in Korea. The background value of each metal was estimated from the core sediment profiles and varied from 35 to 60 mg/kg for Cr, 10 to 23 mg/kg for Ni, 10 to 25 mg/kg for Cu, 55 to 115 mg/kg for Zn, 5.0 to 9.0 mg/kg for As, 0.03 to 0.20 mg/kg for Cd, 15 to 30 mg/kg for Pb, 0.001 to 0.050 mg/kg for Hg and 4.10 to 6.10 % for Al. These values were comparable to the abundances in upper crust and average shale, but the background level of Al was close to the half value of both abundances. The background variation of heavy metals may result from the regional specificity in the geology of sediment. Enrichment factor (EF) of heavy metals was calculated by comparing the level of their regional background. The EF values of Cu, Zn, Cd and Hg were greater than 1.5 in most samples, which indicate that these metals might be anthropogenically contaminated in most parts of study areas. Comparing to the regional average EF values of heavy metals in study areas, Hg was the most severe contaminant showing the average EF of 15.8. The regional average EF of Hg was higher than 10 in four areas and was up to 110 in Tongyeung harbor. The average EF value of Cu and Cd was 5.45 and 4.24, respectively. In particular, the average EF of Cu was higher than 10 in Onsan and South Busan harbor, and that of Cd was higher than 10 in South Busan harbor. The order of high EF of heavy metals was Hg>Cu>Cd>Zn>Pb>Ni>As>Cr.