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Environmental chemistry on heavy metal pollution in urbanized areas (Tokyo, Osaka, and Bangkok) associated with anthropogenic effects.

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論 文 要 旨

Abstract

論文題目

Title

Environmental chemistry on heavy metal pollution in urbanized areas (Tokyo, Osaka, and Bangkok) associated with anthropogenic effects.

人間活動に伴う都市部（東京、大阪、バンコク）における重金属汚染に関する環境化学的研究

In order to elucidate the sources of metal pollutants in urbanized areas, metal contents and Pb isotope ratios were determined using road-side dust and sediments samples collected from Tokyo, Osaka, Kyoto and Bangkok. The samples were leached by 1% HNO₃ to measure metal concentrations and Pb isotopes analysis. Metal (Pb, Cd, Zn, As, Cr and Ni) concentrations and Pb isotopes (²⁰⁶Pb, ²⁰⁷Pb and ²⁰⁸Pb) in the solutions were analyzed by inductively coupled plasma mass spectrometry (ICP-MS). Considering a Pb background of 21.0 ppm measured in the Okinawan road-side dust, the average of Pb in road-side dust of Tokyo was found to be about twelve times higher, indicating Pb pollution in the streets of Tokyo. The range of the Pb isotope ratios in Tokyo, Kyoto, and Osaka road-side dust agreed well to that in river and pond sediments (²⁰⁷Pb/²⁰⁶Pb = 0.8644–0.8688 and ²⁰⁸Pb/²⁰⁶Pb = 2.1044–2.170), suggesting that sediments might be transported through contaminated road-side dust. Moreover, Pb isotope ratios (²⁰⁸Pb/²⁰⁶Pb and ²⁰⁷Pb/²⁰⁶Pb) of Tokyo, Osaka, and Kyoto confirmed that Pb pollution in their road-side dust and sediments was associated with the combination of battery and solder products. In case of heavy metal pollution in surrounding areas of Bangkok, the investigation of the heavy metal contents and Pb isotope ratios in the Chao Phraya River sediments were determined to elucidate the sources of metals. Highest ranking of pollutant of Cd, Cu, Cr, Pb, and Zn contents was found from the samples that were located near to the center of Bangkok. Pb isotope ratios (²⁰⁸Pb/²⁰⁶Pb: 2.075–2.113 and ²⁰⁷Pb/²⁰⁶Pb: 0.834–0.868) in the Chao Phraya River sediments near to the centers of Bangkok agreed to those in the Bangkok road side dust and pond sediments, suggesting that the river sediments were contributed from road-side dust and pond sediments. Moreover, Pb isotope ratios confirmed that the polluted sediments were contributed as Pb products of fly ashes (municipal waste combustors) in Bangkok (²⁰⁸Pb/²⁰⁶Pb: 2.100–2.120 and ²⁰⁷Pb/²⁰⁶Pb: 0.867–0.870).

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