SPECIES OF MANGANESE, IRON, LEAD, CHROMIUM AND CADMIUM IN THE ANTARCTIC OCEAN AND TAIWAN ERHJIN CHI COASTAL SEDIMENTS

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ABSTRACT

Species of manganese, iron, chromium, and cadmium including exchangeable, skeletal, readily reducible (Fe and Mn oxides), moderately reducible (crystalline Mn oxide), organic combined with sulfide, and detritus with minerals, in mud and sand, separated from the surface of the Antarctic Ocean and from the Taiwan Erhjin Chi coastal (including river and estuarine) sediments, have been analyzed by means of sequential leaching methods. Greater concentrations of manganese (414 mg/kg), lead (10.8 mg/kg), chromium (45.4 mg/kg), and cadmium (2.21 mg/kg) were found in sediments consisting mostly of mud, compared with smaller concentrations of manganese (251 mg/kg), lead (7.31 mg/kg), chromium (31.8 mg/kg), and cadmium (1.21 mg/kg) in sediments consisting mostly of sand. The dominant species contained in the Antarctic Ocean mud and sand sediments were the moderately reducible (up to 100%) and detritus with mineral phases (up to 84.6%), which are possibly due to the characteristics of manganese nodules. The content of total iron and the iron species were not determined in the Antarctic mud and sand samples; only the total iron concentrations (25000-34400 mg/kg) were found in the Antarctic Ocean sediments. In the Taiwan Erhjin Chi coastal sediments, the concentrations of manganese (187-704 mg/kg), iron (14800-45200 mg/kg), lead (18.0-427 mg/kg), chromium (30.3-85.9 mg/kg), and cadmium (0.11-3.01 mg/kg) vary with season and location. Generally, high values were obtained in the river sediments during the dry season. Most manganese, lead, and cadmium species, exchangeable and skeletal phases found in the Erhjin Chi coastal sediments, are possibly correlated with pollutants discharged from nearby cities.

INTRODUCTION

Since Chester and Hughes (1967) first proposed a method for the separation of species from pelagic sediments by combination extraction, there have been several studies, for instance, Presley et al. (1972), Nissenbaum (1972, 1974), Engler et al. (1974), Forstner and Patchineelam (1980), Aplin and Cronin (1985), Chester et al. (1988). However, little has been reported on the species of trace metals in the Antarctic Ocean and the Taiwan Erhjin Chi coastal sediments.

The species of copper and zinc, such as exchangeable, skeletal, readily reducible (Fe and Mn oxides), moderately reducible (crystalline Mn oxide), organic matter combined with sulfide, and detritus with minerals, have been studied in mud and sand, separated from the surface of the Antarctic Ocean and the Taiwan Erhjin Chi coastal sediments (Hung et al. 1991A). The results indicate that high concentrations of total copper and zinc in the Antarctic Ocean sediments may be due to the characteristics of manganese nodules in which the species of copper and zinc mainly contained in the crystalline Mn-oxide phase. The second highest species in the Antarctic Ocean sediments is the species of organic matter combined

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