XVI. MANGANESE IN THE INTERSTITIAL WATER OF PELAGIC SEDIMENTS FROM THE GH78-1 AREA

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Introduction

TSUNOGAI and KUSAKABE (1981) have demonstrated that manganese in the deep sea sediments migrates with interstitial water after reduced to manganous ion even if the oxidation potential of the sediments is not so low as to reduce iron from ferric compounds to ferrous compounds. The reduced manganous ion seems to be related to the formation of manganese nodules in the ocean. However the concentration of manganese in interstitial water has not so well been studied especially for the pelagic sediments in the oxidizing environment (e.g. CALVERT and PRICE, 1972: LI *et al.*, 1969). We collected red clay in the central North Pacific and analyzed for manganese in its interstitial water.

Methods

Collection of interstitial water

Sediment samples were collected at various stations in the central North Pacific with an Okean-70 grab sampler and box corers and cut into 4 cm sections. Interstitial water was obtained with a squeezer which was operated with nitrogen gas under a pressure of 1.5 to 2.0 atm. at room temperature. From about 50 g of sediments 10 to 15 ml of interstitial water was collected and 1 ml of 2 N sulfuric acid solution was added to each sample. The samples were freezed and stored until they were treated for chemical analysis in the laboratory on land.

Chemical analysis

Manganese was determined directly by an atomic absorption spectroscopic method. The detection limit was 0.05 ppm.

Results and discussion

The locations and depths of the samples are given in Table XVI-1. All the observed concentrations of manganese in the interstitial water samples were lower than the detection limit (0.05 ppm).

These core samples are so-called red clay, namely the oxidizing sediments, and they are extremely short, of 32 cm at most. Therefore manganese in this sediments may not be reduced and the reduced manganese in deeper layer, if any, seems to be deposited before it reaches to the surface layer by diffusing with interstitial water. It is necessary to obtain longer cores for further discussion on the manganese migration.

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Table XVI-1 Locations and depths of samples collected for interstitial water, and manganese contents

Station	Location and water depth	Depth of sample taken (cm)	Mn content (ppm)
1037-1	08°59.9′N	0–4	<0.05
	176°58.1′E	6–10	<0.05
	5225 m	12–16	<0.05
		18–22	<0.05
1038A	10°00.2′N	0–4	<0.05
	176°59.3′E	6–10	<0.05
	6140 m	12–16	<0.05
		18–22	<0.05
		24–28	<0.05
		30–32	<0.05
1042	12°59.9′N	0–4	<0.05
	177°58.4′E	6–10	<0.05
	5803 m	12–16	<0.05
		18–22	<0.05
1043	12°00.9′N	0–4	<0.05
	178°00.0′E	6–10	<0.05
	5608 m	12–16	<0.05
		18–20	<0.05
1045	09°59.3′N	0–4	<0.05
	178°00.6′E	6–10	<0.05
	5380 m	12–16	<0.05
		18–22	<0.05
		24–28	<0.05
1049	09°04.4′N	0–4	<0.05
	179°02.4′E	4–6	<0.05
	5983 m	6–10	<0.05
		10–12	<0.05
		12–16	<0.05
1050	09°59.7′N	0–4	<0.05
	179°00.7′E	6–10	<0.05
	5603 m	12–16	<0.05
		18–22	<0.05
		24–26	<0.05
1051	10°59.1′N	0–4	<0.05
	179°01.1′E	6–10	<0.05
	5235 m	12–16	<0.05
		18–22	<0.05
1053	12°57.5′N	0–4	<0.05
	179°01.3′E	6–10	<0.05
	4910 m	12–16	<0.05
		18–20	<0.05
1054	12°59.6′N	0–4	<0.05
	179°59.8′E	6–10	<0.05
	5053 m	12–16	<0.05
		18–22	<0.05
1056	10°58.8′N	0–4	<0.05
	179°58.6′W	6–10	<0.05
	5930 m	12–16	<0.05
		18–22	<0.05

Table XVI-1 (Continued)

Station	Location and water depth	Depth of sample taken (cm)	Mn content (ppm)
1056		24–28	<0.05
1059	07°59.6′N	0–4	<0.05
	179°59.4′W	6–10	<0.05
	6056 m	12–16	<0.05
		18–22	<0.05
1060	12°59.1′N	0–4	<0.05
	178°59.5′W	6–10	<0.05
	5720 m	12–16	<0.05
		18–22	<0.05
		24–26	<0.05
1061	11°59.8′N	0–4	<0.05
	179°02.6′W	6–10	<0.05
	5632 m	12–18	<0.05
1065	08°32.2′N	0–4	<0.05
	179°28.7′E	6–10	<0.05
	6159 m	12–16	<0.05
		18–22	<0.05
		24–29	<0.05
1071	08°30.5′N	0–4	<0.05
	176°30.4′E	6–10	<0.05
	5020 m	12–16	<0.05
		18–22	<0.05
		24–28	<0.05

References

CALVERT, S. E. and PRICE, N. B. (1972) Diffusion and reaction profiles of dissolved manganese in the pore waters of marine sediments. *Earth Planet. Sci. Lett.*, vol. 16, p. 245–249..

LI, Y.-H., BISCHOFF, J. and MATHIEU, G. (1969) The migration of manganese in arctic basin sediments. *Earth Planet. Sci. Lett.*, vol. 7, p. 265–270.

TSUNOGAI, S. and KUSAKABE, M. (1981) Migration of manganese in the deep sea sediments. *In* FANNING, K. A. and MANHEIM, F. T., (*eds.*), *The Dynamic Environment of the Ocean Floor*, p. 257–273, D. C. Heath, Lexington, Mass.