Chemical Studies on the Ocean. (LII)

Chemical Studies of the Shallow-water Deposits. (8)[1] On the Chemical Constituents of the Shallow-water Deposits along the Sea-coast of Aichi Prefecture

Masayoshi ISHIBASHI and Shunzō UEDA*

Received April 4, 1956

We analysed 8 kinds of the deposits from the sea-coast of Aichi prefecture, comparing their chemical composition with that of Korean muds reported in the previous papers, and found that the average contents of K_2O, P_2O_5, N and MnO reported in the present paper are similar to those of the Korean muds, respectively.

INTRODUCTION

The shallow-water deposits immediately along the sea-coasts of Japanese Main Land are made up chiefly of sands, gravels and boulders and of a small quantity of muds, differing from those along the sea-coasts of Korea[2]. The prefectures where the muds can be seen in many places are only a few, including Aichi, in Japanese Main Land. It is shown in the Chart No. 1055** that mud banks dry, extending over a comparatively large area, at nearly lowest low water near the estuary of the Shōnai and Tenhaku Rivers in Aichi prefecture. We came to collect the muds from the sea-coast of Aichi prefecture in order to investigate the distribution of the chemical constituents in them and to compare with Korean muds. About the sampling, we consulted with Aichi Fisheries Experiment Station beforehand and selected several localities.

In this paper, the analytical results on the 8 kinds of the deposits from these localities are described.

SAMPLES

Locality and date of sampling are shown in Table 1.

All of these samples are the deposits collected in the neighbourhood of the shoreline.

Sample 18: grayish green fine mud containing a small quantity of shell fragments; collected by K. Kawabe on the north side of the estuary of the Shio River; in this district, shallow-muds have been used for a long time as the earth brought from another place.

Sample 19: grayish green fine mud containing a small quantity of shell fragments;

---

* 石橋 雅義, 上田 俊三

** Issued by the Japanese Hydrographic Office in 1947.

Table 1.

Sample No.	Locality	Date
18	Yoshigo, Taharamachi, Atsumigun, Aichiken	Sept. 18, 1948
19	Ura, Taharamachi, Atsumigum, Aichiken	Sept. 9, 1948
20	Namiirie, Oitsumura, Atsumigun, Aichiken	Sept. 19, 1948
21	Nakane, Terazumachi, Hazugun, Aichiken	Sept. 30, 1948
22	Yoshihama, Takahamamachi, Hekikaigun, Aichiken	Sept. 12, 1948
23	Ishikiri, Kamezaki, Handashi, Aichiken	Oct. 4, 1948
24	Nawa, Uenomachi, Chitagun, Aichiken	Oct. 20, 1948
25	Sankaku, Shimonoishikimachi, Nakagawaku, Nagoyashi, Aichiken	Sept. 25, 1948

collected by T. Suzuki at the point about 2.5 km north of the estuary of the Shio River.

Sample 20 : grayish green sandy mud ; collected by J. Suzuki at the point about 200 m southwest of the estuary of the Sakae River.

Sample 21 : grayish green sandy mud ; collected by B. Sugiura at the mouth of the inlet of Heisaka port ; in this district, the deposits are used as the earth brought from another place.

Sampls 22 : grayish green fine mud containing shell fragments ; collected by R. Naitō at the sea-coast of Yoshihama ; the deposits are used as an important fertilizer in this district.

Sample 23 : grayish green sandy mud containing shell fragments ; collected by H. Sakata at the point about 200 m southwest of the northern cape of Kamezakimachi.

Sample 24 : grayish green mud containing coarse sand ; collected by H. Isobe at the point about 1.5 km south of the estuary of the Tenhaku River.

Sample 25 : grayish green fine mud containing shell fragments ; collected by T. Naruse at the estuary of the Shōnai River ; the deposits are on sale as a fertilizer in this district.

The geology of the land adjacent to the locations sampled is, without exception, Quaternary. Further, the Tertiary formations are found only in the neighbourhood of the locations of Samples 23 and 24. The lower part of the mountainous areas in this Aichi district is composed of Tertiary rocks, and in their higher part, granites, quartz porphyry and the Paleozoic formations distribute.

EXPERIMENTAL PROCEDURE, RESULTS AND DISCUSSION

Experiments were carried out as described previously[3].

The analytical results of the air-dried samples are shown in Table 2. From this table we obtained the percentages of chemical constituents in the sea-salt-free samples

Table 2. Chemical composition of the deposits.

Sample No.	18	19	20	21	22	23	24	25
	%	%	%	%	%	%	%	%
Drying loss	5.92	11.10	2.84	2.18	6.90	1.68	3.38	4.25
Ignition loss	8.70	10.90	4.63	3.44	12.90	4.21	5.14	7.16
Fe_2O_3	4.12	5.84	3.20	3.07	4.89	2.00	3.28	4.27
TiO_2	0.54	0.54	0.39	0.15	0.44	0.37	0.42	0.39
Al_2O_3	12.40	12.07	9.34	11.12	16.94	7.45	12.46	14.62
MnO	0.04	0.05	0.04	0.03	0.03	0.03	0.02	0.05
CaO	0.97	1.58	0.87	1.48	4.58	1.84	0.92	1.82
MgO	1.67	1.04	0.32	0.63	1.12	0.52	0.74	1.08
K_2O	1.77	1.67	1.69	2.48	1.90	2.07	2.69	2.26
Na_2O	1.58	2.71	1.94	2.13	1.33	1.25	1.25	1.58
SiO_2	61.65	52.43	74.16	71.97	48.67	78.48	69.24	61.76
SO_3	1.54	2.64	1.03	0.55	0.98	0.48	0.58	0.45
Cl	1.17	3.20	0.71	0.49	0.88	0.37	0.38	0.13
P_2O_5	0.16	0.17	0.06	0.06	0.15	0.06	0.06	0.19
CO_2	0.40	0.67	—	—	2.41	1.12	—	0.57
N	0.06	0.10	0.19	0.10	0.12	0.15	0.06	0.18

Table 3. Chemical composition of the deposits on sea-salt-free and dry basis (calculated from Table 2).

Sample No.	18	19	20	21	22	23	24	25
	%	%	%	%	%	%	%	%
Fe_2O_3	4.48	7.03	3.34	3.17	5.34	2.05	3.42	4.47
TiO_2	0.59	0.65	0.41	0.15	0.48	0.38	0.44	0.41
Al_2O_3	13.48	14.52	9.74	11.47	18.51	7.63	12.99	15.31
MnO	0.04	0.06	0.04	0.03	0.03	0.03	0.02	0.05
CaO	1.01	1.78	0.89	1.52	4.97	1.87	0.95	1.91
MgO	1.67	0.82	0.25	0.60	1.11	0.49	0.73	1.12
K_2O	1.89	1.91	1.74	2.55	2.05	2.11	2.79	2.37
Na_2O	0.77	0.40	1.47	1.83	0.74	1.00	1.01	1.55
SiO_2	67.04	63.08	77.35	74.25	53.19	80.37	72.18	64.66
SO_3	1.52	2.73	0.99	0.51	0.96	0.45	0.56	0.45
P_2O_5	0.17	0.20	0.06	0.06	0.16	0.06	0.06	0.20
CO_2	0.43	0.81	—	—	2.63	1.15	—	0.60
N	0.07	0.12	0.20	0.10	0.13	0.15	0.06	0.19
Na_2O+K_2O	2.66	2.31	3.21	4.38	2.79	3.11	3.80	3.92
K_2O/Na_2O	2.45	4.78	1.18	1.39	2.77	2.11	2.76	1.53

dried at 105~110°C as shown in Table 3*.

From the above results, it is seen that the fine muds such as Samples 18, 19, 22 and 25, are lower in SiO_2 and higher in Fe_2O_3 and Al_2O_3 comparing with the other sandy muds.

The K_2O content is comparatively high in general, being about 2 % or more in most samples. Such K as contained in these deposits may originate in the weathered materials of rocks which are rich in K, carried by the river water, and also may have been concentrated by adsorption, ion exchange, etc. from sea-water.

Now, we compare the chemical composition of these deposits with that of 20 kinds of Korean muds which was already reported[2].

The SiO_2 content shown in this report seems to be higher, being above 70 % in Samples 20, 21, 23 and 24, than Korean muds in which it is mostly less than 70 %.

The Fe_2O_3 content ranges 2.05~7.03 %, being less than 5 % in many samples, and is lower than Korean muds in which it is mostly above 5 %.

The Al_2O_3 content ranges 7.63~18.51 % and the mean value amounts to 12.96%, which is lower than that of Korean muds, i.e. 15.14 %.

The P_2O_5 content ranges 0.06~0.20 %, and the mean value amounts to 0.12 %, which is almost the same as that of Korean muds, i.e. 0.11 %.

As for the CaO and MgO contents, their average values amount to 1.86 % (0.99 %)** and 0.85 %, respectively, which are lower than those of Korean muds, i.e. 2.37% (1.89%)** and 1.56%, respectively.

As for the MnO and N contents, their average values are similar to those of Korean muds, respectively.

The K_2O content ranges 1.74~2.79% and the mean value amounts to 2.18%, which is similar to that of Korean muds, i.e. 2.31 %.

From the above, it is found that the average contents of K_2O, P_2O_5, N and MnO reported in this paper are similar to those of the Korean muds, respectively, though there are some differences between them regarding the contents of SiO_2, Al_2O_3, Fe_2O_3, CaO and MgO.

We wish to express our thanks to Mr. Y. Kaseno, Assist. Professor of Faculty of Science, Kanazawa University, and to Mr. T. Nagai, the Head of Aichi Fisheries Experiment Station for their helpful advice, and further, to Messrs. K. Kawabe, T. Suzuki, J. Suzuki, B. Sugiura, R. Naitō, H. Sakata, H. Isobe and T. Naruse who presented us many valuable samples.

* We performed this calculation on the basis of the same assumption as in the previous paper[1].

** The parenthesized values are the average CaO content in the shell fragments ($CaCO_3$)-free samples, calculated on the basis of CO_2 data.

REFERENCES

(1) This investigation (7): M. Ishibashi and S. Ueda, This Bulletin, **34**, 117 (1956).
(2) M. Ishibashi, *J. Agr. Chem. Soc. Japan*, **16**, 245 (1940); **17**, 67 (1941); M. Ishibashi and S. Ueda, This Bulletin, **33**, 165 (1955); **33**, 170 (1955).
(3) M. Ishibashi and S. Ueda, This Bulletin, **34**, 117 (1956).
(4) M. Ishibashi and S. Ueda, This Bulletin, **33**, 165 (1955).