Chemical Studies on the Ocean-LXIII.

Chemical Studies of the Shallow-water Deposits-16.

On the Chemical Constituents of the Shallow-water Deposits along the Sea-coasts of Chiba, Kanagawa and Shizuoka Prefectures*

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Abstract: In this paper, the analytical results of 10 kinds of deposits from the sea-coasts of Chiba, Kanagawa and Shizuoka Prefectures are described. From these results it is found that the blackish sands from Sagami Bay have considerably different chemical composition from others, being exceedingly low in SiO_2 and K_2O and high in Fe_2O_3 , Al_2O_3 , CaO , MgO , etc.

As for the K_2O content reported in this paper, it is exceedingly low on the whole, being about 1% or lower in many samples, and is especially low in those of Sagami Bay.

1. Introduction

In the previous paper (UEDA, 1956), the author has reported on the chemical composition of 8 kinds of the deposits from the sea-coasts of Wakayama and Mie Prefectures. In this paper, the analytical results on 10 kinds of deposits from the sea-coasts of Chiba, Ka-

nagawa and Shizuoka Prefectures are described.

2. Samples

Locality and date of sampling are shown in Table 1.

All of these samples are the deposits col-

Table 1. Locality and date of sampling.

Sample No.	Locality	Date
83	Suna, Hasunumamura, Sanbugun, Chibaken	Aug. 12, 1948
84	Hamamachi, Anesaki, Anesakimachi, Ichiharagun, Chibaken	Aug. 8, 1947
85	Honmachi, Funabashishi, Chibaken	Aug. 9, 1947
86	Kanazawamachi, Isogoku, Yokohamashi, Kanagawaken	Aug. 27, 1948
87	Ōiso, Ōisomachi, Nakagun, Kanagawaken	Aug. 19, 1948
88	Sakawa, Sakawamachi, Ashigarashimogun, Kanagawaken	Aug. 3, 1947
89	Usamimura, Tagatagun, Shizuokaken	Sept. 28, 1947
90	Tago, Tagonouramura, Fujigun, Shizuokaken	Aug. 12, 1948
91	Chihama, Chihamamura, Ogasagun, Shizuokaken	Oct. 10, 1947
92	Hamana, Araimachi, Hamanagun, Shizuokaken	Aug. 23, 1947

lected in the neighbourhood of the shoreline.

Sample 83: light brown sand; collected by H. KAWASHIMA at the sea-coast of Suna.

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Sample 84: blackish gray sand; collected by T. KOIDE at the sea-coast of Hamamachi.

Sample 85: light blackish brown sand; collected by S. TAKAHASHI at the point near the estuary of the Ebi River.

Sample 86: grayish sand containing small amounts of shell fragments; collected by K.

KōDA at the Otsutomo sea-coast (in the neighbourhood of Kanazawa Elementary School).

Sample 87: blackish sand; collected by T. UCHIDA at the point about 1.6 km southwest of the estuary of the Hanamizu River.

Sample 88: blackish sand; collected by T. SAWA at the point about 1.5 km northeast of the estuary of the Sakawa River.

Sample 89: blackish brown sand containing shell fragments; collected by E. ENDŌ in the neighbourhood of the estuary of the Naka River.

Sample 90: blackish gray sand; collected by A. YAMAMOTO at the point about 1 km west of the estuary of the Numa River.

Sample 91: light blackish gray sand; collected by M. SUYAMA at the point about 400 m southeast of the estuary of the Kiku River.

Sample 92: light blackish gray sand; collected by J. ISHIDA at the western sand bar of the Hamana Lake (at the point near the Experimental Forest of Tokyo University).

The size composition of these samples is shown in Table 2.

Table 2. Size composition of the deposits.

Sample No.	Mesh ^(a)						
	>8	14	28	48	100	200	pan
83	0%	0%	1%	7%	26%	66%	0%
84	2	0	18	42	28	10	0
85	4	0	6	31	42	14	3
86	3	1	2	11	49	34	0
87	2	30	59	8	1	0	0
88	13	13	30	29	11	4	0
89	2	12	36	38	12	0	0
90	2	16	8	32	37	5	0
91	0	0	2	65	32	1	0
92	0	0	1	65	33	1	0

(a) Tyler standard.

The geology of the land adjacent to the locations sampled is briefly as follows:

Sample 89 was collected at the sea-coast of the land composed of andesite; the others, at the coast of Quaternary formations. Furthermore, Tertiary formations are found relatively near the location where Sample 86 was collected.

Table 3. Chemical composition of the deposits.

Sample No.	83	84	85	86	87	88	89	90	91	92
Drying loss	0.83%	0.85%	1.41%	0.67%	0.87%	0.80%	4.57%	0.42%	0.22%	0.29%
Ignition loss	1.92	1.10	1.94	2.25	1.11	0.94	5.03	1.61	1.15	1.15
Fe ₂ O ₃	3.32	5.34	4.13	3.73	8.01	8.23	8.25	4.10	2.02	2.03
TiO ₂	0.18	0.32	0.19	0.26	0.75	0.88	0.44	0.28	0.11	0.38
Al ₂ O ₃	13.13	9.38	10.03	12.91	15.28	17.64	17.87	11.95	11.02	11.65
MnO	0.04	0.15	0.06	0.07	0.14	0.18	0.19	0.07	0.04	0.02
CaO	3.86	3.82	3.12	4.44	7.19	7.54	5.95	2.60	2.01	2.20
MgO	1.45	3.68	2.44	1.87	3.68	5.49	3.48	2.02	0.83	1.16
K ₂ O	1.01	0.42	0.59	0.70	0.17	0.11	0.08	1.04	1.51	1.96
Na ₂ O	2.64	1.74	2.21	2.75	2.77	2.35	1.42	2.24	2.08	2.67
SiO ₂	70.01	72.78	74.39	70.82	60.09	55.73	53.15	74.43	78.72	77.72
SO ₃	0.13	0.18	0.44	0.12	0.06	0.03	0.15	0.14	0.02	0.04
Cl	0.85	0.02	0.24	0.10	0.01	0.09	0.31	0.15	0.13	0.05
P ₂ O ₅	0.07	0.04	0.05	0.05	0.14	0.13	0.09	0.09	0.04	0.07
CO ₂	—	—	—	0.30	—	—	1.45	—	—	—
N	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

3. Experimental Procedure, Results and Discussion

Experiments were carried out as described previously (ISHIBASHI and UEDA, 1956 a).

The analytical results of the air-dried samples are shown in Table 3. From this table we obtained the percentages of chemical constituents in the sea-salt-free samples dried

Table 4. Chemical composition of the deposits on sea-salt-free and dry basis (calculated from Table 3).

Sample No.	83	84	85	86	87	88	89	90	91	92
Fe ₂ O ₃	3.40%	5.39%	4.21%	3.76%	8.08%	8.31%	8.70%	4.13%	2.03%	2.04%
TiO ₂	0.18	0.32	0.19	0.26	0.76	0.89	0.46	0.28	0.11	0.38
Al ₂ O ₃	13.45	9.46	10.22	13.02	15.42	17.81	18.84	12.03	11.07	11.69
MnO	0.04	0.15	0.06	0.07	0.14	0.18	0.20	0.07	0.04	0.02
CaO	3.92	3.85	3.17	4.48	7.25	7.61	6.26	2.62	2.02	2.21
MgO	1.39	3.71	2.46	1.88	3.71	5.53	3.64	2.01	0.82	1.15
K ₂ O	1.01	0.42	0.59	0.71	0.17	0.11	0.07	1.05	1.52	1.97
Na ₂ O	2.06	1.75	2.07	2.70	2.78	2.30	1.25	2.14	1.99	2.64
SiO ₂	71.71	73.43	75.78	71.43	60.63	56.27	56.02	74.95	79.08	78.02
SO ₃	0.03	0.18	0.42	0.11	0.06	0.02	0.12	0.12	—	0.03
P ₂ O ₅	0.07	0.04	0.05	0.05	0.14	0.13	0.09	0.09	0.04	0.07
CO ₂	—	—	—	0.30	—	—	1.53	—	—	—
N	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Na ₂ O+K ₂ O	3.07	2.17	2.66	3.41	2.95	2.41	1.32	3.19	3.51	4.61
K ₂ O/Na ₂ O	0.49	0.24	0.29	0.26	0.06	0.05	0.06	0.49	0.76	0.75

at 105~110°C as shown in Table 4*.

In the deposits reported in this paper, there are relatively many blackish sands, and among them, the deposits which were collected at Sagami Bay have different appearances from others, being similar to those of Aomori and Iwate Prefectures already reported (ISHIBASHI and UEDA, 1956 b), which were particularly blackish, so the author expected that these samples should have the similar chemical composition to that of blackish sands from Aomori and Iwate Prefectures which were exceedingly low in SiO₂ and high in Fe₂O₃, CaO, MgO, etc. The analytical results have supported the author's speculation on the whole.

As obvious from Table 4, the SiO₂ content ranges 56.02~79.08% and is exceedingly lower in Samples 87, 88 and 89 which were collected at Sagami Bay.

The Fe₂O₃ content is relatively high in many samples of this report, being especially high in the Sagami Bay deposits, ranging 8.08~8.70%, and it is seen that the TiO₂ and MnO contents are generally high in those of high Fe₂O₃ content, and the former is espe-

cially high in Samples 87 and 88, and so is the latter in Samples 88 and 89.

As for the CaO and MgO contents, they are also high in many samples of this report, and especially so in those collected at Sagami Bay.

Thus the samples from Sagami Bay are exceedingly low in SiO₂, and high in Fe₂O₃, CaO, MgO, etc., and moreover, it is remarkable that they are considerably higher in Al₂O₃ than others.

As for alkalis, the K₂O content reported in this paper is exceedingly low on the whole, being 1% or lower in all the samples except Samples 91 and 92, especially low in all deposits from Sagami Bay, ranging 0.07~0.17%. The average K₂O content amounts to only 0.76%, which is noticeable being considerably low just alike to that of the deposits from Aomori and Iwate Prefectures, 1.18% (ISHIBASHI and UEDA, 1956 b), and that of the deposits from Wakayama and Mie Prefectures, 1.17% (UEDA, 1956). The Na₂O content is comparatively high on the whole, being about 2% or more in most samples, while the K₂O content is so poor as mentioned above, that the Na₂O+K₂O content becomes considerably low. Namely, it ranges 1.32~4.61%, and its mean value amounts to only 2.93%

* The author performed this calculation on the basis of the same assumption as in the previous paper (ISHIBASHI and UEDA, 1955).

which is almost the same as that of the deposits from Wakayama and Mie Prefectures, 2.98%.

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