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Chemical Studies of Minerals Containing Rarer Elements from Far East District.[1] LXVI. Cookeite from Nagatare, Fukuoka Prefecture, Japan

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Granite pegmatite dikes exposed at Nagatare, Fukuoka Prefecture, are famous for the occurrence of lepidolite,[2] petalite,[3] amblygonite-montebrasite series minerals,[4] and pollucite,[1] the last three being unique occurrences in Japan. Hand specimen of a white or pink mass collected from the dump derived from one of the pegmatite dikes turned out to be the first cookeite in Japan, though contaminated by quartz. This note describes the results of X-ray, chemical and optical studies.

The analyzed material is a part of a light pink mass over 5 cm across and 150 grams in weight. The mass is composed of the aggregate of larger quartz grains and mixture cookeite flakes with minor lepidolite, which is variable in amount.

X-Ray powder data coincide well with known ones[5] (Table 1), the calculated lattice constants being a_0= 5.188 Å, b_0=9.077 Å, c_0=14.278 Å (all±0.003 Å), and β=97.8±0.1°.

TABLE 1. X-RAY POWDER DATA FOR COOKEITE FROM NAGATARE, FUKUOKA PREFECTURE, JAPAN, AND LONDONDERRY, AUSTRALIA

h k l	1			2	
	d(obsd)	I	d(calcd)	d	I
0 0 1	14.2	24	14.2	14.1	80
0 0 2	7.08	34	7.08	7.05	70
0 0 3	4.72	100	4.72	4.70	70
0 0 4	3.54	59	3.54	3.52	90
0 0 5	2.830	27	2.832	2.815	30
2 0 0	2.571	7b	2.571	2.56	40
2 0 $\bar{2}$	2.52	8b	2.527	2.505	70
0 0 6	2.357	8	2.369	2.35	5
2 0 2	2.320	13	2.320	2.315	10
0 0 7	2.020	10	2.023	2.015	10
2 0 4	1.96	10b	1.960	1.96	50
0 0 8	1.767	3b	1.770	1.76	10
2 0 6	1.634	7b	1.634	1.635	45
0 6 0	1.490	10b	1.492	1.489	70

1: Cookeite. Nagatare, Fukuoka Prefecture, Japan. Cu/Ni radiation. Diffractometer method. Calculated d-values are based on a_0=5.118 Å, b_0=9.077 Å, c_0=14.287 Å, β=97.8° b=broad

2: Cookeite. Londonderry, Australia, ASTM Card No. 16-363

TABLE 2. CHEMICAL ANALYSIS[a] OF COOKEITE FROM NAGATARE, FUKUOKA PREFECTURE

Component	wt%	Molecular quotient	Metal number	Oxygen number	Metal number as O=10
SiO_2	34.50	0.5741	0.5741	1.1482	3.042
Al_2O_3	46.21	0.4532	0.9064	1.3596	4.802
Fe_2O_3	0.08	0.0005	0.0010	0.0015	0.0053
B_2O_3	trace				
MnO	trace				
Li_2O	3.86	0.1292	0.2584	0.1292	1.369
Na_2O	0.08	0.013	0.0026	0.0013	0.013
K_2O	0.26	0.0028	0.0056	0.0028	0.030
H_2O	14.11	0.7800			
F	1.55	0.0816			
$-F_2=O$	0.65				
Total	100.00				

a) Recalculated after deducing quartz.

Chemical analysis, the results of which are given in Table 2 was carried out on the material contaminated by quartz which can not be removed by heavy liquids, suggesting the specific gravity to be neary equal in each, *i.e.* about 2.7. The procedure of chemical analysis was as follows: Li_2O—atomic absorption analysis; Na_2O and K_2O—flame photometry; SiO_2, Al_2O_3 and H_2O—gravimetry; Fe_2O_3—spectrophotometry; F—volumetry. Boron, though too low to be determined colorimetrically, was detected by emission spectrographic analysis. The present cookeite is specified due to its higher fluorine content as well as the relation K >Na in mole ratio.

The crystallochemical formula calculated from the analytical data based on O=10 for the layered part and (OH, F)=8 for the interlayering one is $[(Al_{1.995}Fe_{0.005})(OH_{1.916}F_{0.084})Al_{0.958}Si_{3.042}O_{10}]^{-0.958}[(Li_{1.369}K_{0.030}Na_{0.013}Al_{1.849})(OH_{5.746}F_{0.254})]^{+0.959}$ satisfying the crystallochemical formula by Cerny.[6]

It is optically biaxial negative, 2V is very small, refractive indices are α=1.560, $\beta\fallingdotseq\gamma$=1.591, $\gamma-\alpha$= 0.031; colorless in thin section. The pink color in the hand specimen may be due to the presence of manganese as surmised by Kanaoka and Kato.[7]

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