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Manuscript submitted October 14, 1965, emended January 5, 1966

ADDITIONAL DATA ON THE COMPOSITION OF SPENCITE

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ABSTRACT

Quantitative analysis of the rare earth fraction of spencite indicates that the stoichiometry reported by Frondel on the basis of an incomplete analysis must be revised.

Frondel (1961), in his report on the new mineral spencite, gives an analysis by one of us (C. O. Ingamells) in which the essential rare earth constituents are only partly differentiated. At the time the analysis was performed, facilities for resolving the individual lanthanons were lacking, and they were reported as follows:

Y_2O_3 group	28.20 wt. per cent
La_2O_3 group	4.16 wt. per cent
Ce_2O_3	1.44 wt. per cent
ThO_2	2.44 wt. per cent

A more complete analysis of spencite, in which quantitative spectrographic values for all the rare earths are included (Table 1) can now be reported.

The rare earths and thorium were separated from the sample by successive precipitation as fluoride, oxalate, and hydroxide. The weight of oxides so obtained amounted to 36.07% of the sample, as compared to 36.24% obtained originally. The sample was not identically the same as that used for the original analysis, and the new values have been adjusted to yield the same total as previously.

Spectrographic analysis was accomplished with a Bausch & Lomb dual grating spectrograph, using a method developed especially for rare earth minerals. The sample (of chemically separated rare earths plus thorium oxide) was mixed 1:1:5 with internal standard-radiation buffer mixture (Sc_2O_3 in $SrCO_3$) and graphite and burnt to completion in the

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Contribution No. 65–52

TABLE 1. ANALYSIS OF SPENCITE

	Weight %	Atoms per 8 (B, Si, Al, P, Ti)	
Na_2O	.11	.04	
K_2O	.01	.00	
MgO	.50	.12	
CaO	7.81	1.42	2.09
SrO	.05	.01	
Fe_2O_3	3.22	.41	
FeO	.00	.00	
MnO	.60	.09	
Y_2O_3	17.77	1.58	
La_2O_3	.73	.04	
CeO_2	2.49	.14	
Pr_6O_{11}	.54	.03	
Nd_2O_3	1.84	.11	
Sm_2O_3	1.07	.06	
Eu_2O_3	.14	.01	
Gd_2O_3	1.61	.09	
Tb_4O_7	.34	.02	2.49
Dy_2O_3	1.92	.10	
Ho_2O_3	.50	.02	
Er_2O_3	1.99	.10	
Tm_2O_3	.31	.02	
Yb_2O_3	2.88	.14	
Lu_2O_3	.27	.02	
ThO_2	1.84	.01	
Al_2O_3	3.87	.78	
TiO_2	.27	.04	
B_2O_3	10.04	2.95	8.00
SiO_2	24.89	4.23	
P_2O_5	.02	.00	
Cl	.45		
F	.44		
H_2O+	9.82		
H_2O-	1.93		
	100.27		
less O = F, Cl	.28		
	99.99		

D.C. arc. Operating conditions have been described previously (Joensuu & Suhr, 1962). Analytical line pairs are listed in Table 2.

It will be noted that the yttrium content of the mineral is much lower than originally reported; and the stoichiometry calculated by Frondel from the incomplete analysis is not valid. Calculation on the basis of 8 (B, Si, Al, P, Ti) gives 2.5 rare earth atoms instead of 3.0. (Table 1).

Jaffe & Molinski (1962) have recently reported a new analysis of spencite from New Jersey, and compared it with the incomplete analysis referred to above, as well as to analyses of tritomite and rare earth silicate apatites. In none of these analyses are the individual lanthanons resolved.

TABLE 2. ANALYTICAL LINES

Analytical Line	Internal Standard Line
Ce 4133.80	Sc 4023.68
Eu 4129.73	
Pr 4100.74	
Nd 4023.00	
Th 3469.92	
Tm 3462.20	Sc 3359.67
Ho 3456.00	
Er 3364.09	
Gd 3350.48	
Y 3330.88	
Tb 3324.40	
Dy 3319.88	
Sm 3306.37	
La 3303.11	
Lu 3281.74	
Yb 3192.87	

In the light of the new data presented above it must be assumed that this may have a very appreciable effect on the calculated stoichiometries.

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Manuscript submitted April 4, 1966.

THE PROBLEM OF STACKING-ORDER IN NATURAL HYDROZINCITE

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In 1958 the author published the results of his chemical, optical, DTA, and *x*-ray investigation of basic zinc carbonate (hydrozincite) which formed incrustations on the planking in the Orzel Bialy mine at Brzeziny Slaskie, Upper Silesia, Poland. In a recent paper, Jambor (1964) postulated the existence of two varieties of natural basic zinc carbonate, differing slightly in their CO_2 and H_2O contents, temperature of endothermic effect, *x*-ray powder patterns, and infrared absorption in the region of OH stretching vibrations. On the basis of the author's (Zabinski, 1958)