ing in the jar; the results showed 7.2 per cent K_2O (Onorato, oral comm., 1960).

The results of our investigations indicate that the original analysis on which the formula for paternoite is based (Millosevich, 1920) must in part be in error, and that the supposed new mineral is kaliborite; Prof. Onorato (oral comm., 1960) concurs with us. We suggest, therefore, that the name paternoite be relegated to synonomy.

The Commission on New Minerals and Mineral Names, IMA, has voted its approval of adding paternoite to the 1964 list of discredited mineral names.

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AN INTERMEDIATE MEMBER OF THE BINARY SYSTEM FeS_2 (PYRITE) – CoS_2 (CATTIERITE)

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INTRODUCTION

Examination of a mineral sample from Chibuluma (one of the Rhodesian Selection Trust Group mines on the Northern Rhodesian Copperbelt) proved it to be a high cobalt-bearing pyrite, approximately midway between the two end members of the binary system FeS_2 (pyrite) – CoS_2 (cattierite). It is reported here because no specimen from the mid-range of the series has been described previously.

Microchemistry indicated major iron and cobalt only, and a semi-quantitative optical spectrographic examination showed the presence of minor quantities of silicon, nickel and arsenic. The material was checked for phase monotropy using a metallographic technique and was found to consist of a single phase, with no visible exsolution features at magnifications up to 2240 diameters. The sample was extremely pure and warranted only minor purification.

X-RAY DATA

The *x*-ray data (Table 1) were obtained on a Philips machine using a 114.59 mm diameter Debye-Scherrer camera and a glass capillary preparation, with silicon as an internal standard. An exposure of 10 hours using iron filtered cobalt radiation ($\lambda K\alpha_1 = 1.78890$ Å, and $\lambda K\alpha_2 = 1.79279$ Å), gave a pattern of the pyrite type. The doublets in the back reflection region were clearly resolved. The film was read on a Norelco viewer to an accuracy of 0.05 mm. Nine $K\alpha_1$ reflections of the back reflection region were used for cell size determination. The unit cell values were plotted against the function

$$\frac{1}{2}\left(\frac{\cos^2\theta}{\sin\theta}+\frac{\cos^2\theta}{\theta}\right)$$

TABLE 1. *X*-RAY POWDER DATA OF AN INTERMEDIATE MEMBER, COMPARED WITH THE END MEMBERS OF THE BINARY SYSTEM FeS_2 (PYRITE)—CoS_2 (CATTEIRITE)

(hkl)	Pyrite	Inter. Member	Cattierite
	dÅ[1]	dÅ obs. (I)[2]	dÅ[3]
(111)	3.128	3.156 (42)	—
(200)	2.709	2.736 (84)	2.756
(210)	2.423	2.451 (69)	2.468
(211)	2.212	2.325 (64)	2.254
(220)	1.916	1.935 (58)	1.954
(311)	1.633	1.650 (100)	1.666
(222)	1.564	1.582 (37)	1.595
(230)	1.503	1.520 (40)	1.532
(321)	1.445	1.464 (50)	1.477
(420)	1.211	1.224	1.238
(421)	1.182	1.194	1.207
(332)	1.155	1.167	1.180
(422)	1.106	1.118	1.130
(511)	1.043	1.053	1.065
(432)	1.006	1.016	1.028
(521)	.989	.999	1.011
(440)	.958	.968	.979
(600)	.903	.912	—

[1] Pyrite values taken from A.S.T.M. card 6-0710—Cu radiation.

[2] Intensities based on photocell measurements—Co radiation.

[3] Values from Kerr (1945)—conversion factor of 1.00202 used for kX to Ångstrom units—Fe radiation.

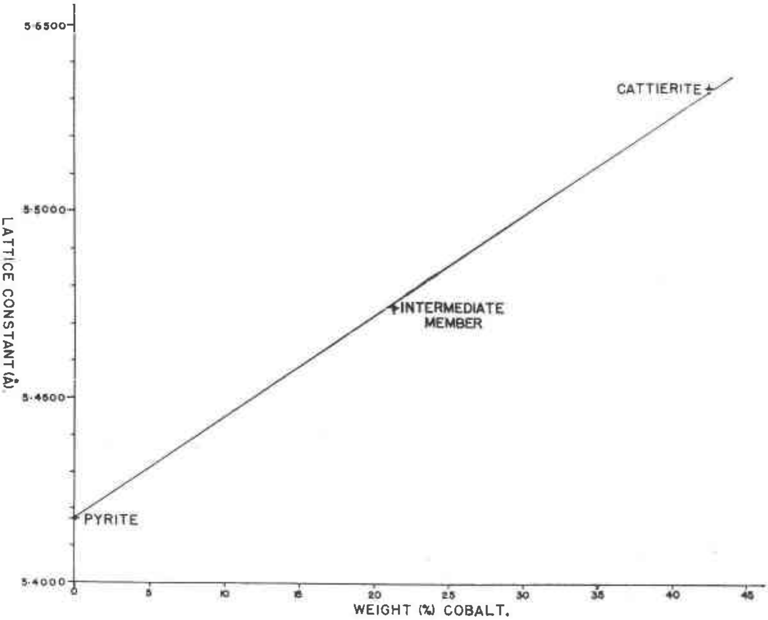

FIG. 1. Lattice constant (Å) plotted against weight percentage cobalt for pyrite, cattierite and intermediate member.

and the value of a extrapolated to $\theta = 90°$, according to the method of Nelson and Riley (1945). A figure of 5.4750 Å ± .0005 was obtained. Temperature control was not available, but the room temperature never varied more than ±2° C. during exposure.

CHEMICAL DATA

The results of the chemical analyses are tabulated below in Table 2.

TABLE 2. CHEMICAL ANALYSIS OF AN INTERMEDIATE MEMBER OF THE BINARY SYSTEM FeS_2 (PYRITE)—CoS_2 (CATTIERITE)

Element	Weight Percentage							
	Co	Fe	S	Ni	Cu	As	Insol.	Total
1st Determination	20.8	24.9	52.2	.3	.03	.1	.7	—
2nd Determination	21.3	24.5	52.4	.3	—	.1	.7	—
3rd Determination	20.5	24.7	—	—	—	—	—	—
Arithmetic Average	20.9	24.7	52.3	.3	Tr.	.1	.7	99.0
Recast analysis	21.3	25.1	53.2	.3	—	.1	—	100.0

Cobalt values were obtained colorimetrically by the formation of a complex with nitroso-R-salt. The iron was determined volumetrically by standardization against potassium dichromate solution and the sulfur was determined gravimetrically. Nickel values were also obtained colorimetrically by the dimethylglyoxime method. The Gutzeit procedure was used for arsenic.

A recast analysis appears at the bottom of Table 2.

DISCUSSION

Figure 1 shows a plot of weight percentage cobalt against the lattice constant in Ångstrom units. The position of the intermediate member is shown relative to normal pyrite and the cattierite of Kerr (1945; anal. by M. Vaes; Kerr's unit cell value converted to Ångstrom units and taken as 5.5346 Å).

Further investigations of a similar nature, into this simple, natural system, are being carried out. Present indications are that the system approximates to a linear series.

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RUTILE AND ANATASE DETERMINATION IN SOILS AND SEDIMENTS

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The titanium oxide minerals, rutile and anatase, often termed "accessory minerals," are usually present as a few per cent of soils and sediments; because of their high resistance to weathering they are used often as index minerals. Their content in soils varies widely, from less than 0.5 per cent in young or little weathered soils of temperate regions to 4 per cent or more in many soils of the tropical regions. Unusually high contents of TiO_2, up to 25 per cent or more have been reported in the highly weathered humic ferruginous latosols of Hawaii (Sherman, 1952). The presence of rutile and anatase in sedimentary kaolins (Nagelschmidt *et al.*, 1949), in fireclay deposits (Ennos and Scott, 1924; Brindley and Robinson, 1947) and in hydrous micas of Swedish origin (Rosenqvist, 1963) have been reported.