A NEW OCCURRENCE OF GRIPHITE[1]

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Recently, the College Park Division, Metallurgical Branch, Bureau of Mines, was called upon to identify two mineral samples submitted by the Foreign Economic Administration. According to information furnished by that agency, both samples were obtained from a deposit near Mt. Ida, about 100 miles northwest of Alice Springs, Northern Territory, Australia. One of these was identified as tantalite-columbite, and the other proved to be a complex fluophosphate of manganese, iron, aluminum, calcium and the alkalis. The latter material is now identified as griphite, considered by Dana to be a problematical phosphate.

This material occurs in brownish-black reniform masses, some of which contain a surface coating of iron and manganese oxides. It is vitreous to resinous in luster and brittle, and shows a conchoidal fracture. The specific gravity, as determined with the Jolly balance, is 3.43 and the hardness between 5 and 6. It is greenish-brown in transmitted light and optically isotropic. Its refractive index is variable within the range of 1.630 to 1.660. The material selected for analysis was essentially homogeneous. Other pieces contained microscopic impurities, of which muscovite, quartz, lazulite and goethite were identified.

A chemical analysis by R. Dwiggins and A. Yelmgren is as follows:

P_2O_5	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	Na_2O	K_2O	Li_2O	F	Cl	H_2O
39.15	9.44	6.95	10.67	18.12	5.98	3.47	0.18	0.47	3.03	0.12	2.62 = 100.20

Spectrographic analysis shows a large trace of silica and minor traces of Cr, Sn, V and Be. Tests made with a Geiger-Müller counter indicate that it is slightly radioactive, although the source of the activity could not be detected spectrographically.

Griphite has previously been reported from only two localities, both in South Dakota. It was first described as triplite by L. G. Eakins (1) in 1890. Eakins' material came from a tin mine near Rapid City, S. D. He writes, "In reality, it probably represents a mixture but in general appearance it seems to be fairly homogeneous and in composition it approaches closely to triplite." Apparently Eakins did not attach much significance to the relatively high Al_2O_3 content or regarded it as a contamination from another mineral. The host rock is not described, but the association of the phosphate with tin suggests pegmatite. Griphite was named by W. P. Headden (2) in 1891 from γριφος, an enigma, "in allu-

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sion to its unusual and somewhat enigmatic composition." Headden's material was from the Riverton tin lode near Harney City, Pennington County, S. D. Headden says "It occurs in the granite common to the district, in kidney-shaped masses, some of them weighing upwards of fifty pounds, but they are not numerous." Headden's granite is undoubtedly one of the South Dakota tin-bearing pegmatites described by F. L. Hess (3) and subsequent investigators.

The analyses of Eakins (a), Headden (b) and Dwiggins and Yelmgren (c) compare favorably, the principal difference being a higher iron to manganese ratio in the Australian sample. McConnell (5) obtained an x-ray powder-diffraction pattern of Headden's material and described griphite as a hydrophosphate garnetoid. The Australian material gives no discernible powder-diffraction pattern with Cu, Mo or Fe radiation and appears to be amorphous in the natural state. Upon heating it to be-

	P_2O_5	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	Na_2O	K_2O	Li_2O	F	Cl	H_2O
(a)	39.68	8.74	2.36	1.97	29.13	6.72	5.25	tr.	0.13	2.35	0.25	3.67
				(SiO$_2$ 0.43		CO$_2$ 0.26)=100.94						
(b)	38.52	10.13	—	4.00	29.64	7.62	5.52	0.30	tr.	tr.	0.11	4.29
					(insol. 0.16)=100.29							
(c)	39.15	9.44	6.95	10.67	18.12	5.98	3.47	0.18	0.47	3.03	0.12	2.62
							=100.20					

(C)-Griphite, Australia		(M)-Griphite, South Dakota	
d	*I*	*d*	*I*
3.40	s	3.39	1
—		3.264	½
3.09	m	3.066	4
2.99	m	2.97	4
2.89	m	2.884	1
2.76	s	2.743	10
2.51	s	2.498	4
—		2.408	1
—		2.362	1
2.29	w	2.281	3
—		2.018	3
1.84	w	1.832	2
—		1.770	2
1.70	w	1.700	3
1.65	w	1.637	6
—		1.604	1
—		1.563	1
—		1.536	1
1.48	w	1.478	2
—		1.344	1
—		1.325	1
—		1.303	1

tween 300°C. and 500°C., H. F. Carl obtained a powder-diffraction pattern (C) with an automatic recording Philips x-ray spectrometer which compares favorably with that obtained by McConnell (M) with unfiltered iron radiation. The crystallinity of the Australian material may be similar to that of certain tantalum-columbium minerals. Fergusonite, for example, is normally amorphous in the natural state but becomes crystalline after being heated to 400°C. (4).

Acknowledgment

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LOELLINGITE FROM ARIZONA

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Loellingite ($FeAs_2$), a comparatively rare arsenic mineral, has been identified as a minor constituent of a zinc-copper ore mined from the Copper World Mine near Yucca, Arizona. It is an uncommon mineral and believed not previously described from Arizona. A description of its occurrence, mineralogical associations and chemical analysis is of interest at this time.

The Copper World Mine was rehabilitated with a preliminary development loan from the Government to mine high grade zinc sulfide as an aid to the war effort. During the development program, the mine was visited periodically to check on the progress and to note any changes. In December, 1945, during a routine examination of the underground workings, a few small specimens of a heavy, bright-silvery looking mineral were pointed out as being new in the ore. Some of the miners had uncovered a boulder of this material about the size of a man's head on the fifty-foot level, and at that time they were much excited for they believed it to be a mass of solid silver. During this excitement much of the original boulder