

On Derbylite, a new Antimono-titanate of Iron, from Tripuhy, Brazil.

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A BRIEF notice of this new mineral, which was found associated with Lewisite in the cinnabar-bearing sands of Tripuhy, near Ouro Preto, Minas Geraes, Brazil, has already been given by the authors in *Min. Mag.* Vol. XI. No. 50, p. 85. Since that time a sufficient amount of material ($1\frac{1}{2}$ grms.) has been separated from the sand to permit a more detailed investigation of its crystallographic and chemical characters.

Crystallographic and other physical characters (E. H.).

Derbylite crystallises in the orthorhombic (holohedral) system.

Axial ratios : $a : b : c = 0.96612 : 1 : 0.55025$.

Fundamental angles : $100 : 110 = 44^\circ 0' 45''$.

$001 : 011 = 28^\circ 49' 18''$.

Observed forms : $\infty P(110) m$, $\infty \bar{P}\infty(100) a$, $0P(001) c$.

The prism faces are very smooth and brilliant, while the macropinacoid is for the most part rough. The rare basal plane is always uneven and arched, and a conchoidal fracture parallel to this plane is frequently observed. Terminal faces are lacking, and the inclination $001 : 011$ is calculated from the twinning law.

Twinning (see Figure) is frequent, giving staurolite-like contact and intergrowth forms according to the law :—twinning plane a face of (011) , whereby the vertical axes of the two individuals cross at an angle of $57^\circ 38' 36''$, and the macropinacoids of both individuals fall into the same plane; the angle between two adjacent prism faces of the two individuals was measured as $39^\circ 8' 25''$. From these angles the value of $001 : 011$ was calculated as $28^\circ 49' 18''$.

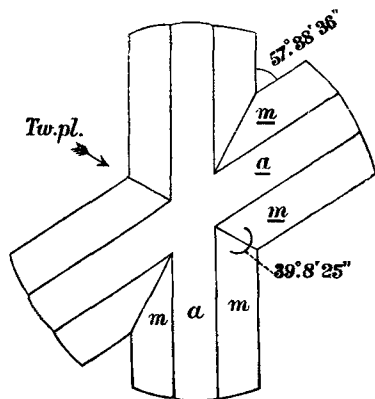
Triplets according to the same law also occur, but are rare.

Colour : pitch black, translucent in thin splinters, with a dark brown tint.

Lustre : resinous, especially well shown on fractures parallel to 001.

Hardness : about 5, not determinable with exactness on account of the minuteness of the crystals and their extreme brittleness, due to the conchoidal fracture parallel to 001.

Optical Properties. These also proved indeterminable in the thinnest section which could be prepared by the well-known firm of Voigt and Hochgesang in Göttingen. The mineral is translucent in extremely thin splinters only, and on these the only points determinable were that it is biaxial, and not notably pleochroic.



Specific Gravity (G. T. P.). A determination made with a 9cc. pyknometer upon 0.7549 gm. gave as the weight of 1cc. at 18°, 4.530. Two previous determinations made on different samples in much smaller amount (0.1121 gm. and 0.1945 gm. respectively) gave 4.529 and 4.512.

Chemical Characters (G. T. P.).

Derbylite is insoluble in acids, but is decomposed by fusion with acid sulphate of potassium. With salt of phosphorus it gives in the reducing flame a bead, yellow when hot, violet when cold.

Two quantitative analyses have been made. For the preliminary analysis, No. I., only 0.1281 gm. was available; for the second, more complete, analysis, No. II., 0.5263 gm. was used. Unfortunately the material for the analyses could not be completely freed from a white adhering impurity.

Result of Analyses.

	I.		II.		Molecular Ratios.
Sb ₂ O ₃	19.0	Sb ₂ O ₃	24.19		·075
TiO ₂	35.8	TiO ₂	34.56		·420
SiO ₂	3.1	SiO ₂	3.50		·058
		Al ₂ O ₃	3.17		·031
FeO	33.9	FeO	32.10		·447
CaO	0.4	CaO	0.32		·006
		Na ₂ O	0.76		·012
		K ₂ O	0.28		·003
Loss on ignition	0.5	Loss on ignition	[0.50]		
			(from I.)		
Undetermined	(7.3)				
(partly loss of Sb ₂ O ₃)					
	<hr/>		<hr/>		
	100.0		99.38		
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If the SiO₂, Al₂O₃ and alkalis be not regarded as essential constituents but as due to impurity, the simplest formula suggested by the numbers obtained in Analysis II. is FeO.Sb₂O₃ + 5 FeO.TiO₂.

Method of Analysis. In both analyses the mineral was decomposed by heating in a current of hydrogen. The reduced material was digested with a mixture of nitric and tartaric acids, to which hydrochloric acid was added later in order to expel the nitric. A considerable amount of a black residue remained undissolved. This consisted mainly of Ti₂O₃, but retained some iron and antimony. In the preliminary analysis the insoluble residue was collected on a filter and was afterwards ignited, so that some loss of antimony certainly occurred. In the second analysis, therefore, the insoluble residue was transferred to a silver crucible and fused with caustic soda. The product was dissolved in a mixture of hydrochloric and tartaric acids, and treated separately from the original solution, though in a similar way. The antimony was precipitated by sulphuretted hydrogen, and the iron in the filtrate by ammonium sulphide. After the destruction of the tartaric acid, the titanium was precipitated by ammonia and the calcium with ammonium oxalate. After weighing, the titanate acid mixed with silica and alumina was fused with acid potassium sulphate and the silica separated. The titanium in the solution was then precipitated by long continued boiling, and the alumina in the filtrate by ammonia.

Mode of occurrence of Derbylite (E. H.). The mineral was found in the cinnabar-bearing gravel of the fazenda Tres Cruzes, Tripuhy, near Ouro Preto, Minas Geraes, Brazil. The minerals accompanying it, including Lewisite, have been already noted in this Magazine (*loc. cit.*). The Derbylite was first found in loose crystals, from 2 to 3 mm. long, and in fragments of crystals, in the sand. The crystals had often intergrowths of muscovite on the ends of the prisms, being in this respect similar to Lewisite, which often shows inclusions of quartz grains and flakes of muscovite. Later observations prove that both minerals come from the thin bedded muscovite-schist which accompanies itabirite in the neighbourhood of Tripuhy, and recently both these titano-antimonates have been found *intergrown* with specular iron in fragments of this *muscovite-schist* found in the gravel.

The name of Derbylite has been given to the mineral after Orville A. Derby, Director of the Geographical and Geological Survey of the State of S. Paulo, Brazil, in commemoration of his great services in the Geology of Brazil.
