

(Na light) α 1.741, β 1.746, γ 1.755 (all ± 0.003). Ferrous iron was determined by fusion of the mineral in sodium metafluoroborate, following the procedure given by Groves (1951); water by a modified Penfield method, the mineral sample being heated in a silica tube for half an hour by an oxy-coal gas burner, the temperature reached being about 1300° C. The number of metal atoms have been calculated on the basis of 48(O,OH) to the unit cell: Si 7.807, Al 17.163, Fe^{III} 0.706, Ti 0.178, Mg 0.874, Fe^{II} 2.515, Mn 0.015, Ca 0.064, OH 3.510; Al+Fe^{III} 17.869; Fe^{II}+Ti &c., 3.646. If Ti and Ca are grouped with Fe^{II}, Mg, and Mn, the resultant formula agrees best with that proposed by Juurinen (1956), namely Fe₄Al₁₈Si₈O₄₄(OH)₄.

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Serpierite from the Lake District.

SERPIERITE, a basic sulphate of copper, zinc, and calcium, was first described in 1881 from the Camareza section of the Laurium mines in Greece; in 1927 Sir Arthur Russell¹ described a second occurrence at Ross Island, Killarney, Co. Kerry, in Ireland, this being the first and hitherto only known locality in the British Isles. One other locality, in Kazakhstan, in the U.S.S.R., has since been recorded, but it is a rare mineral.

We have recently found and confirmed the occurrence of serpierite at two localities in the northern part of the Lake District. First, at Driggith Mine, Caldbeck, where in some massive, intergrown chalcopyrite and blende, derived from the 30-fathom level, serpierite occurs in narrow veinlets or coating surfaces of joints; it forms aggregates of tiny, pale-blue, lath-like crystals, with a pearly lustre, and at first sight could be confused with aurichalcite. Its identity was confirmed by powder-photographs which exactly match that of authenticated serpierite from Laurium. On some of the specimens from Driggith mine the serpierite is intimately associated with another pale-blue, pearly mineral, in minute hexagonal plates, which gives an entirely different but well-defined powder-pattern, but has so far remained unidentified.

The second occurrence is in a small copper vein near Potts Gill, which has produced an astonishing variety of secondary copper, lead, and zinc minerals and which we hope to describe shortly. At this locality the serpierite forms tufts of minute, pale-blue needles and resembles the Ross Island and some of the Laurium material; it is associated with smithsonite, malachite, aurichalcite, and other secondary copper minerals.

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¹ Min. Mag. 1927, vol. 21, p. 386.

γ -Manganese dioxide from Mysore, India.

DURING an examination under the ore-microscope of manganese ore from Mysore (My 4, Bidarematti, Kumsi area), I noticed a few clumps of slightly fibrous and platy, greyish-white mineral associated with pyrolusite. An X-ray powder photograph of the mineral using Fe-K radiation gave a different pattern from that of pyrolusite. The spacings observed and tabulated below agree fairly well with the values of McMurdie and Golovato¹ for γ -MnO₂;² the intensities are estimated, and *b* indicates broad lines:

<i>d</i> , Å.	3.15	2.41	2.15	1.83	1.64	1.53	1.34
<i>I</i>	1	10 <i>b</i>	9 <i>b</i>	1	8 <i>b</i>	2	4 <i>b</i>

A synthetic, electrolytically deposited γ -MnO₂ from Japan was furnished for my study by the Winchester research laboratory, New Haven, Connecticut; it gave a pattern in fair agreement with the above spacings.

Differential thermal curves were obtained for both the synthetic and the naturally occurring mineral from Mysore; both show a significant endothermic peak at 600° C. and minor peaks at 250–300° C. and 950° C. The steep peak exhibited at 600° by the synthetic material is probably due to its fineness and purity.

' γ -Manganese dioxide' is unstable at high temperatures. X-ray photographs of the mineral taken after heating to 500° C. showed a pyrolusite pattern, hence the γ -dioxide could be considered as poorly crystallized pyrolusite, but the exact nature of it is still uncertain.

The oxide is of considerable industrial value. Recent research in