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Nigerite, a new tin mineral.

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THE discovery of nigerite, a new tin-bearing mineral, by R. Jacobson and J. S. Webb¹ claims more than the passing interest of an addition to the few known species containing appreciable tin. Nigerite is the first mineral to be discovered in which both tin and aluminium are essential constituents. Its chief interest to mineralogists lies in its close relationship to minerals like spinel and corundum based on a close-packed or nearly close-packed assemblage of oxygen ions.

Samples of nigerite submitted to us for investigation consist of brittle, lustrous, brown, weakly magnetic, hexagonal plates up to 5×2 mm. in size but mostly much smaller. These samples also contained grains of cassiterite, columbite, gahnite, sillimanite, quartz, andalusite, and chrysoberyl, which were easily separated by hand-picking. Many nigerite crystals were encountered intergrown with or enclosing cassiterite, columbite, quartz, and sillimanite and these also were set aside as unsuitable for chemical study. A preliminary spectrographic examination, kindly undertaken for us by Mr. B. S. Cooper of the Research Laboratories of the General Electric Company, Wembley, revealed the presence of Sn, Zn, Fe, Al, and Si; and minor amounts of Mn, Li, Mg, and Ti.² A separate portion of the mineral was also examined in the

¹ R. Jacobson and J. S. Webb, *Min. Mag.*, 1947, vol. 28, pp. 118-128.

² Examination of a separate sample by D. L. Williams in the Museum confirmed these results except for Li and Ti. He also found Pb, Ca, and P. This discrepancy is probably due to non-uniformity of sample.

same laboratories by Mr. L. A. Thomas for piezoelectricity but no positive effect was discovered.

A larger sample also carefully cleaned and hand-picked and containing no visible accessory minerals was then handed to Dr. Hey for complete analysis.

Chemical analysis of nigerite (M. H. Hey).

The material available for analysis (2 grams) contained a small amount of quartz and sillimanite, present as minute inclusions and films on most of the grains, but no other impurities could be observed under the microscope.

Nigerite is insoluble in acids, and is very imperfectly attacked by fusion with sodium carbonate or caustic soda, but readily gives a clear fusion with borax and with sodium pyrosulphate. For the main part of the analysis the mineral was fused with sodium pyrosulphate, and after solution and elimination of SiO_2 the tin was distilled as bromide from the sulphuric acid solution at 200°C .; in the distillate tin was precipitated by NH_3 and weighed as SnO_2 . The residue was treated with H_2S and the precipitate examined in the usual manner; it proved to be wholly PbS , which was converted to PbSO_4 for weighing. The oxidized filtrate from the sulphides was precipitated by ammonia at $\text{pH } 7$, and the precipitate dissolved and reprecipitated twice, ignited and weighed (Al_2O_3 , Fe_2O_3 , TiO_2 , and some ZnO), then fused with sodium pyrosulphate, and iron and titania precipitated with cupferron; after igniting and weighing, the Ti was determined colorimetrically. Ammonium citrate was added to the filtrate from the cupferron precipitate, then ammonia and ammonium sulphide, and the small precipitate of ZnS collected, ignited to ZnO , and weighed, alumina being obtained by difference. In the filtrate from the ammonia precipitate, Zn and Mn were precipitated as sulphides and weighed as oxides, the manganese being determined colorimetrically; calcium was found to be absent, and Mg was determined as 8-hydroxyquinolate and tested for Zn. A second portion was used for determination of loss at 200°C . and on ignition, and for a check tin determination (precipitation of Sn and Pb as sulphides and separation by Am_2S).

The ferrous iron determination by the modified Rowledge method (Min. Mag., 1941, vol. 26, p. 116) encountered unexpected difficulties, the tube swelling up and bursting during fusion; this suggested that the mineral contains a considerable amount of water which is not lost on ignition at about 900°C ., and a water determination made in the Goch

