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Bismuth minerals from Borborema region, Brazil

THE Borborema metallogenetic province in north-eastern Brazil, extending over parts of Paraíba and Rio Grande do Norte states, is well known due to its mineral riches. This note sums up studies made on the bismuth minerals found there.

Mineralization of bismuth is observed both in the pegmatites that cut the mica schists of the Serido formation, and in the skarnites and tactites of the Middle Parelhas formation, both of them belonging to the Ceará series of the Algonkian period. The minerals include native bismuth, bismuthinite, bismutite, bismutotantalite, bismoclite, arseno-bismite, and some doubtful species.

Native bismuth is found as masses in pegmatites and as an accessory in tactites, recovered in the latter during the concentration of scheelite in Brejui Mine near Currais Novos, Rio Grande do Norte state. Masses weighing up to 13 Kg have been found in the Boqueirão pegmatite near Parelhas in the same state. The characteristic association of this mineral in tactites is with molybdenite and scheelite, while in pegmatites it is noted with quartz. It is seen to alter or with a sulphide capping in tactites. The mineral is pure with no special features.

Bismuthinite is found both in the pegmatites and tactites, with a whitish to dark metallic grey colour and a distinct tabular habit. Samples from the Boqueirão pegmatite have shown needles of aphezite (black tourmaline) as inclusions along the cleavages. Its association in Brejui mine is with molybdenite. Some samples that have doubtful characters have been X-rayed and the presence of some other sulphide

minerals, probably as intergrowths, has been confirmed. A spectrochemical study gave minor amounts of Cu, As(?), and Pb(?), and traces of Fe and Se. Under the ore microscope a polished section shows the presence of various intergrowths the details of which are not yet well understood.

Bismutite was also found both in the pegmatites and tactites. The typical localities are Alto Feio near Pedra Lavrada in Paraiba state and the Brejui mine. Samples are of good size, sometimes covered by clayey minerals, and show a massive habit, or clusters of short prismatic crystals. From the Feio pegmatite the mineral is known in intimate association with zircon and native bismuth (Rolf, 1946). Spectrochemical analysis of one sample from Brejui mine showed minor amounts of W and traces of Pb, Cu, Fe, and Ti. X-ray study confirmed the identification with some lines of cerussite(?); a differential thermal study of the samples gave good correspondence with the known data in the literature.

Bismutotantalite samples were obtained from the Acari pegmatites in Rio Grande do Norte state, and from the gravels near Picui and Pedra Lavrada, Paraiba state. They are often as rounded pebbles or fragments showing a dark brownish-grey to reddish-grey colour, with prominent cleavages and metallic lustre. Commonly associated with the columbite-tantalite group of minerals and specially with manganotantalite, they show the characteristic high specific gravity. X-ray study confirmed the identification though other lines due to possible impurities are also recorded.

Bismoclite is also recorded from the Feio pegmatite in intimate association with bismutite and native bismuth. It shows long prismatic form with no discernible faces. A detailed study of this mineral is in the press.

Arsenobismite is a doubtful mineral in this region. One sample in the Mineralogical Museum of this department labelled as from Picui town in Paraiba state showed sub-metallic lustre, yellowish-grey and brown colour with a high specific gravity. When X-rayed it gave reflections corresponding with the A.S.T.M. data for arsenobismite: 3.03, vs; 6.04, s-m; 2.119, m; 3.68, m-w; 1.885, w-m. Further studies could not be made due to scarcity of material.

X-ray study of samples from Boqueirão pegmatite near Parelhas suggest the presence of: wittichenite, cuprobismutite, emplectite, and tetradyomite, but lack of adequate material hampered detailed study and confirmation of these not very frequent species.

Thanks are due to the Crystallographic Laboratory in D.N.P.M. at Rio de Janeiro where X-ray powder photographs are taken.

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Calculation of mineral unit cell contents: FORTRAN computer programme

A COMPUTER programme for the calculation of cell contents of such minerals as micas, hornblendes, olivines, feldspars, pyroxenes, and garnets has been developed for the IBM 1620 computer. From the basic chemical analysis the cell content is recalculated on the basis of 24 oxygen atoms into the form:



The programme may be easily adapted for groups in which OH is zero by dividing the result calculated to O_{24} by 6 (olivines), 3 (feldspars), 8 (pyroxenes), or 4 (garnets), or by altering one card in the source programme. The sole restriction is that not more than 9999 data cards may be processed at once. Floating point arithmetic is used throughout, the atomic ratios in the unit cell are corrected to 0.01. The programme is written in FORTRAN II. The programme execution time is less than 50 sec per data card on the IBM 1620. Any similar computer with storage of 20 K or more could be used. The programme has been checked against hand-calculated data provided by Dr. B. E. Leake, Bristol University.

The programme is available from IBM and is listed under File Number 8.3.004 in the Catalogue of Programs for the IBM 1620 Data Processing System.

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