

The main arsenic mass is crudely layered, with a rough colloform texture. One specimen contains small spherical inclusions of rammelsbergite. Loellingite occurs locally as thin rims and as impregnations of brecciated wall-rock. The arsenic contains less than 0.3% Sb; $a = 3.758 \pm 0.001 \text{ \AA}$, $c = 10.544 \pm 0.003 \text{ \AA}$; D (meas.) = 5.741 ± 0.023 , D (calc.) = 5.786.

The following theory of origin of the native arsenic is proposed: A basic dyke intruded a minor concentration of arsenopyrite. (Pyrite-arsenopyrite veins are known in the vicinity.) When heated to about 600 °C, arsenopyrite broke down giving off an As-rich vapor which was free to migrate (as gas, in solution or in colloidal suspension) and deposit metallic arsenic in favorably located fractures.

While arsenopyrite and nickel arsenides are known at several localities on the island, this is the first reported occurrence of native arsenic in Newfoundland.

POLYLITHIONITE FROM ST. HILAIRE, P.Q.

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Polyolithionite from St. Hilaire, P.Q. has a chemical composition very close to that of the theoretical end member $K_2(Li_4Al_2)Si_8(OH, F)_4O_{20}$. Partial chemical analysis has given: SiO_2 60.7%; TiO_2 2.5; Al_2O_3 10.4; MgO 0.0; CaO 10.3; K_2O 11.9; Li_2O 7.5; total 93.3, volatile constituents to be determined yet.

From single crystal x -ray diffraction studies: $a = 5.3 \text{ \AA}$, $b = 9.2 \text{ \AA}$, $c = 10.2 \text{ \AA}$, $\beta = 100^\circ$. Space group $C2/m$. One-dimension Fourier synthesis verified that polyolithionite is isostructural with the LM polymorphic variety of sheet silicates (lepidolite is another example). Polyolithionite appears to be fully tri-octahedral.

Polyolithionite from St. Hilaire occurs in vugs within pegmatite dykes associated with the nepheline syenite section of the St. Hilaire pluton.

SOME TEXTURAL RELATIONSHIPS OF THE MINERALS IN THE COBALT AREA IN ONTARIO, AND INTERPRETATIONS OF THE RELATIONSHIPS

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The silver deposits in the Cobalt area in Ontario consist largely of mineralized carbonate veins in the Cobalt series sediments. The veins contain a wide variety of cobalt and nickel arsenides, native silver, and silver sulf-antimonides. These minerals occur in a number of ways. The arsenides are present as rosettes, masses, and disseminations in carbonate. The rosettes appear to have been formed by replacement of calcite along grain boundaries, and the masses by a coalescence of the rosettes.

The native silver occurs as cores of the rosettes, and as veinlets in massive arsenides and carbonate. That in the rosettes was likely precipitated by the catalytic action of the nickel and cobalt arsenides, whereas that in the veinlets did not react with the arsenides and was deposited in zones of weakness.

The silver sulf-antimonides are generally present in separate veinlets along the edges of the mineralized carbonate veins and no doubt represent a late stage deposition.

ORIGIN OF CERTAIN IRON-TITANIUM OXIDE AND APATITE ROCKS

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Rocks consisting essentially of iron-titanium oxides and apatite occur as small intrusive-like bodies associated with anorthosites and some alkaline igneous complexes. They have a very consistent composition of two-thirds by volume oxides and one-third apatite, and invariably have ferromagnesian-apatite-rich dikes associated with them.

Experiments in the system magnetite-fluorapatite indicate a eutectic at a composition of approximately two-thirds by volume of magnetite and one-third apatite, which explains the common occurrence of rocks with this composition. Experiments indicate that eutectic mixtures of magnetite and apatite form immiscible liquids with silicate melts having the composition of the dioritic dike rocks commonly associated with oxide-apatite deposits. Mixtures of magnetite, diorite and apatite, containing apatite in excess of thirty percent form three immiscible liquids on melting, an apatite rich one, a magnetite-apatite melt and a silicate melt.

Analysis of coexisting magnetites and ilmenites from naturally occurring oxide-apatite rocks indicate temperatures of formation in the range of 850 to 1000 °C.

Oxide-apatite rocks are concluded to have formed as immiscible liquids that separated from magmas that underwent strong differentiation. It is postulated that high sodium contents in the silicate magmas play an important role in forming these immiscible liquids.

MELTING RELATIONS IN ALKALINE ROCKS

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Sixteen samples of analysed undersaturated alkaline rocks from Canada, Africa and Greenland have been examined petrographically and their liquidus temperatures determined at one atmosphere in air, at one atmosphere in an argon atmosphere and at water vapour pressures up to 1,000 Kg/cm². These samples are believed to be igneous in origin and consist of plutonic types (litchfieldites, nepheline syenites, melteigites, naujaites, ijolites, pulaskites and foyaites) and volcanic types (phonolites, melanonephelinites and nephelinites). In air at one atmosphere pressure, the liquidus temperatures range from 1125 °C for nepheline syenites to 1230 °C. for melanonephelinite. Under an argon atmosphere, the liquidus temperatures are similar but iron-bearing minerals remain in the same oxidation state as in the unheated rock. Water vapour pressure lowers the liquidus temperatures, in some cases by a few hundred degrees.

The dominant crystallization sequence for these rocks is nepheline, feldspar and pyroxene (excepting minor amounts of iron oxides which crystallize first); in most cases the crystallization sequence takes place over a relatively small temperature range, similar to the trends found for basalts (Yoder & Tilley, 1962). X-ray methods have been used to determine the changes in composition of some mineral pairs during cooling. For a number of rocks, tie lines between feldspar and nepheline have been determined in the SiO₂-NaAlSiO₄-KAlSiO₄ system and compare favourably with the slope of the tie-lines suggested by Tilley (1957) for rocks from volcanic and plutonic environments.

PETROGRAPHY AND DIAGENESIS OF RELICT EVAPORITE BEDS FROM THE PERMIAN RANGER CANYON AND MOWITCH FORMATIONS OF THE SOUTHERN CANADIAN ROCKY MOUNTAINS

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The Ranger Canyon and Mowitch Formations, of Upper Permian age, comprise a feature-forming "chert" varying in thickness from 20 feet to 150 feet, persisting from the United States border to the Northwest Territories, then probably to the Arctic Ocean.

The beds are composed of sandstones (with a considerable percentage of both detrital and matrix phosphate), sandy or silty carbonates and silty phosphatic cherts.

Evaporitic conditions appear to have been superimposed on these sediments during lithification resulting in a series of reactions between iron-rich dolomite, detrital silica, phosphate, penecontemporaneous cherty silica and celestine. Dessication features are commonly present such as contraction fracturing resulting in mosaic breccias and sand and celestine-filled Neptunian dykes. Sheet and fissure cracks, with quartz-phosphate