

modified standard cell. In this way it is demonstrated that the bulk chemical changes involved in the talc-carbonate alteration have been the addition of CO_2 and removal of H_2O and a very small amount of O_2 . Little or no magnesium, silicon, iron or nickel metasomatism has occurred. Consequently, the relative fugacities of H_2O and CO_2 in solutions passing through the rocks are likely to have been controlling factors for the alteration and subsequent de-carbonatization.

Talc-carbonate alteration shows no control other than the fabric of the rock and large scale geologic features such as shears about the margins of peridotite lenses and major faults. The contrasting nature of the de-carbonatization which is strictly controlled by joints and fractures suggests that this reversal in the alteration occurred at a later stage in the geological history of the area when the rocks were closer to the surface, the joints and fractures had opened up and were available as channel-ways for circulating solutions.

ATOMIC COORDINATION IN SULPHIDES

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In sulphide minerals the coordination of the cations by the surrounding sulphur atoms generally conforms to the geometry of the electron orbitals of the cations, as deduced from orbital bonding theories. The coordination of the sulphur atoms by the cations, on the other hand, does not always conform to the geometry of the sulphur electron orbitals. Those sulphides exhibiting peculiar sulphur coordination appear to be generally characterized by relatively short metal-metal distances, which implies metallic bonding. When the directions of these metallic bonds are related to those of the metal-sulphur bonds, it is found that the former correspond closely to the directions of cation electron orbitals not used in metal-sulphur bonding. It is concluded, therefore, that the structural configurations of many of the transition metal sulphides can be attributed, in part, to metallic bonding.

THE VARIATION OF MAGNETITE-ULVÖSPINEL AND HEMATITE-ILMENITE COMPOSITIONS IN A DIFFERENTIATED ALKALINE INTRUSIVE

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Mount Johnson is a nearly circular pipe-like hypabyssal member of the Monteregian Alkaline Igneous Province. The intrusive is located in the eastern part of the province of Quebec, Canada.

The lithology varies gradationally and concentrically in plan; from a subvolcanic hawaiite in the center to a porphyritic nepheline syenite on the circumference.

The magnetite-ulvöspinel and ilmenite-hematite solid solution pairs existing in the intrusive are used to trace a change of oxygen partial pressure in the system during crystallization. The change in oxygen partial pressure appears to be controlled by some process similar to the buffer pair Ni-NiO used in experimental petrology. Proof of the oxidation of ulvöspinel to magnetite and ilmenite, suspected from experimental work reported by others, is given.

NATIVE ARSENIC IN NEWFOUNDLAND

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Native arsenic has been found in the Whalesback and Little Bay copper mines on the Springdale Peninsula, Newfoundland. The largest mass, 3 feet long and 2 inches thick, fills a fracture in an altered basic dyke on the 1500 level of the Little Bay mine. The host-rocks are Ordovician basic volcanics cut by numerous dykes.

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.