

Second solution yielded Co = .0409 g, Ni = .0222 g, Fe = .0080 or
Co : Ni : Fe = 5.11 : 2.77 : 1

Third solution yielded Co = .0686 g, Ni = .0113 g, Fe = .0113 g or
Co : Ni : Fe = 6.07 : 1.53 : 1

These experiments serve to show that silver nitrate solution acts more readily on chloanthite than on smaltite, but as a separation method the large amount of silver precipitated is a disadvantage as it tends to retard the action of the solution, which becomes very slow as the amount of silver increases.

The results obtained seem to indicate that a smaltite residue containing little or no nickel might be obtained by sufficiently prolonged application of suitable separation methods.

Paragenesis—Considering first of all, the intergrowths which occur as good crystals, it seems probable that the crystals grew continuously from a mother solution which contained the elements of both smaltite and chloanthite, and that both these minerals were being precipitated as the crystals grew. The absence of definite concentric or zonal structure renders it unnecessary to suppose that the crystals were formed by overgrowth due to sharp changes in the cobalt and nickel content of the solution. A study of the massive ore, however, seems to indicate that chloanthite was formed in greatest quantity during the early stages. The chloanthite areas are not pure but contain minute inclusions which are probably smaltite, and are bordered by smaltite. Apparently chloanthite was predominantly precipitated at first, and smaltite slightly later, but the two periods overlap.

Summary—The crystals examined are not homogeneous mixed crystals of cobalt-nickel diarsenide, but are intergrowths of about equal parts of smaltite and chloanthite, which appear to have been precipitated together. Chloanthite is doubtless much more common at Cobalt than has been supposed as a constituent of massive smaltite ore, and in the aggregate may be responsible for a greater part of the nickel content of Cobalt ores than the more conspicuous niccolite.

Cobaltite Crystals, Columbus Claim

The crystals which have been found at this mine are probably not surpassed in perfection of development by those of any other known locality. They are essentially octahedral in habit, with relatively small cube faces. A small percentage have the cube and octahedron about equally developed but in the great majority the octahedron predominates.

One of the crystals—an octahedron with small cube faces—measures 7 mm. between cube faces.

These crystals have been analyzed by J. S. De Lury¹⁸ and found to contain notable amounts of iron and nickel. Remembering the slight solubility of cobaltite relative to the more common arsenides, which was displayed in the separation of minute cobaltite crystals from niccolite and breithauptite and also bearing in mind the very small capacity of this mineral for precipitating silver from silver sulphate solutions, noted by Palmer and Bastin,¹⁹ the writer decided to subject

¹⁸ Cobaltite Occurring in Northern Ontario, Canada, by Justin S. De Lury—*American Journal of Science*, Vol. XXI, April, 1906.

¹⁹ Metallic Minerals as precipitants of silver and gold, *Economic Geology*, Vol. 8, No. 2, March, 1913.