NICKELIFEROUS VERMICULITE AND SERPENTINE FROM WEBSTER, NORTH CAROLINA[1]

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INTRODUCTION

The present paper comprises the results of a continuation of the mineralogic investigation of a series of specimens collected by the senior author, during the past summer, in the Webster, North Carolina, dunite area which has been described by Pratt and Lewis.[2] An account of the nickeliferous deweylite from this locality has previously been presented,[3] and the green micaceous mineral here described was mentioned.

NICKELIFEROUS VERMICULITE

The mineral first to be described is a peculiar micaceous material that becomes plastic when wet, which occurs with the deweylite about one-half mile south of the Tuckasegee River and about 1 mile east of Webster where the presence of these minerals has led to some desultory prospecting.

The nickeliferous vermiculite forms lens-shaped veins, which reached a maximum length of nearly a meter and a width of 2 to 8 centimeters. They often contain or are bordered by films of porous, white sinter-like chalcedony, and are imbedded in the siltlike soil that has resulted from the decomposition of the dunite. Light green actinolite, pale lavender kämmererite, a colorless chlorite, and the cream-colored serpentine described below are associated with the nickeliferous vermiculite. The latter mineral has clearly formed, in part at least, by the replacement of actinolite, and it has probably also replaced kämmererite. The actinolite now forms isolated island-like areas that are the residual remains of a single crystal. The development of the platy micaceous mineral at the expense of acicular actinolite proves that the structure of the former is not inherited, but is a property of the mineral itself.

[1] Published by permission of the Director of the United States Geological Survey and the Secretary of the Smithsonian Institution.

[2] Pratt, Joseph Hyde, and Lewis, J. Volney: *N. C. Geol. Survey*, **1**, 92–95, (1905).

[3] Ross, Clarence S., and Shannon, Earl V.: The so-called genthite from Webster N. C., *Am. Mineral*, **10**, 444–445, (1925).

The nickeliferous vermiculite is not euhedral, but some plates suggest an hexagonal outline. It commonly occurs in distorted or helminth-like piles of crystal plates, but some of it forms felted masses of platy crystals. The piles of crystal plates are 5 to 30 mm. long and 1 to 10 mm. in diameter. The felted material is fine-grained and some of the plates are not over 0.01 mm. in diameter. The distorted form of the crystals and the accompanying warping of the plates may be due, in part, to the plasticity of the mineral, but the curved or radial shape seems to be a normal structure that is characteristic of the substance. The wet mineral is very plastic, notwithstanding the comparatively large size of the crystal plates. On heating the mineral exfoliates and expands into accordion-like masses in the manner characteristic of vermiculites. It greatly resembles talc but does not have a talcose feel, and is more sectile than talc.

The cleavage is very perfect parallel to the base and the laminae are flexible but are inelastic and fragile. The luster is silky on the base and dull in other crystallographic directions. The hardness is approximately 1. Optically the mineral is uniaxial to biaxial with $2V=0°-8°$. It is negative in character with the acute bisectrix, X, normal to the base. The apparent biaxial character of most of the crystals plates may be due to a slight strain but it seems more probable that the mineral is truly biaxial. The refractive indices are $\alpha=1.542$, $\beta=\gamma=1.573$. The double refraction is thus moderately high, $\gamma-\alpha=0.031$. The dispersion, $\rho>\nu$, is weak. In thin section the mineral is perceptibly pleochroic with X pale green, Y and Z pale yellowish to brownish-green. Absorption $Z=Y>X$.

The color in the hand specimen is bright green when wet, bright apple to light green when dry. The occurrence of the larger plates in a finer groundmass, coupled with the visible remnants of other minerals and some limonite stain gives hand specimens of the mineral a very heterogeneous and unpromising appearance, but selected crystal plates are very pretty and indicate a clear-cut mineral.

Two lots of nickeliferous vermiculite were prepared for analysis and the results are given below. The analysis given under column 1 was made upon hand picked, pearly, brilliant pale yellow-green, talc-like scales that averaged about 4 mm. in diameter. That given under column 2 was made upon material composed of evenly-

sized, bright apple green scales that had been freed from a small proportion of earthy impurities by washing. Microscopic examination showed that both samples were free from all the associated minerals, but No. 1 contained a small number of scales that were slightly stained with iron oxide.

The analysis in column 1 was made upon 0.1000 gram of material. The accurate analysis in 2 was made upon ample material while the ratios derived from this analysis are given in column 3. These indicate that the formula representing the analysis is: $3MgO.NiO.Al_2O_3.4SiO_2.6\frac{1}{2}H_2O$

The theoretical composition calculated from this formula is given in column 4. Analysis No. 2 shows, however, that the nickel-magnesia ratio is accidental, and that these bases are isomorphous, so that the formula is best written: $4(Mg,Ni)O.Al_2O_3.4SiO_2.6\frac{1}{2}H_2O$.

The mineral is apparently common at the locality and after it had been studied a large number of specimens were found in both the mineral and ore collections of the National Museum. These were all labeled "garnierite," when received, while all the nickeliferous deweylite in the group of specimens was labeled "genthite."

CHEMICAL COMPOSITION AND RATIOS OF NICKELIFEROUS VERMICULITE

	1	2		3		4
SiO_2	35.70	34.76	.580	.580	.96×4	36.8
Al_2O_3	12.00	14.86	.146	.163	1.08×1	15.6
Fe_2O_3	3.40	2.74	.017			
FeO	....	0.41	.006	.467	1.03×3	
CaO	0.32	0.40	.007			
MgO	25.90	18.18	.454			18.4
NiO	5.34	11.25	.151	.151	1.00×1	11.4
$H_2O+120°$	12.00	12.60	.700	.988	1.00×6½	17.8
$H_2O-120°$	7.00	5.20	.288			
Total	101.66	100.45				100.00

NICKELIFEROUS SERPENTINE

A mineral occurring in small amounts with the micaceous material described above has been analyzed and found to be serpentine. This occurs as small cream-colored to greenish-white rounded pellets. It has a mean refractive index of 1.558. The analysis, made upon a little less than a quarter of a gram of selected pure material, gave the following results:

Nickeliferous Serpentine	
SiO_2	39.36
Al_2O_3	2.76
Fe_2O_3	2.77
CaO	1.32
MgO	36.71
NiO	2.57
$H_2O+120°C$	13.85
$H_2O-120°C$	1.54
Total	100.88

This chemical composition is typical of serpentine, except for the small proportion of nickel, and the optical and other physical properties are those of serpentine.

DUMORTIERITE FROM NEVADA

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Introduction

Dumortierite-sericite schist is being utilized in the production of refractories. In view of this application, the identification of dumortierite assumes added importance. A dumortierite of a Nevada schist gave such strong dispersive effects that ordinary light could not be employed in the determination of refractive index data. Since mineralogists have come to place considerable importance on refractive index determination, the difficulty encountered in the case of this mineral is worth recording. The probable source of the various colors of dumortierite is also mentioned.

Occurrence

A schist occurring on the west slope of Lincoln Hill in the Rochester mining district, Nevada, appears to have been first described by Jones[1] as a result of a reconnaissance through the district in 1913. The schist is better referred to as a dumortierite-sericite schist than as a mica-tourmaline schist as first suggested by Dr. Jones on the basis of a rather hasty reconnaissance. While tourmaline was common in the veins of Lincoln Hill it was rarely found in the schist.

[1] Geology of Rochester, Nevada: *Min. & Sci. Press*, **106**, No. 20, May 17, 1913, p. 738.