SCHEELITE DISCOVERED IN CERTAIN SOAPSTONE DEPOSITS IN THE BLUE RIDGE OF MADISON COUNTY, NORTH CAROLINA

Minerals Research Laboratory March 1972 Progress Report
EHB Project Proposal No. 24
Lab Book No. 292

by Edwin H. Bentzen III and Leonard S. Wiener

ABSTRACT

In 1954 scheelite was discovered in the dump of an abandoned soapstone mine in the Big Laurel - Foster Creek section of Madison County, North Carolina. Since that time, scheelite has been identified in the dumps at six of the old soapstone mines and has been observed in stream sediments in the area. This is the first reported occurrence of scheelite in talc deposits.

INTRODUCTION

During the progress of work carried out by the Minerals Research Laboratory, aimed at the recovery and use of talc from North Carolina soapstone deposits, it came to our attention that scheelite occurs in certain soapstone deposits in Madison County, North Carolina. It is our belief that the scheelite occurrences are related to the formation of the soapstone deposits. Therefore this report contains data not only pertinent to the scheelite, but also that data related to the soapstone mining that has taken place in the past.

BACKGROUND OF INITIAL WORK

In 1970 the Minerals Research Laboratory and the North Carolina Division of Mineral Resources began a State-wide project to locate soapstone deposits and evaluate these deposits as a potential source of high quality ground talc. During the period 1970 through 1971, over two dozen mines and outcrops were located and sampled. This project was termed a

success in that we were able to produce talc of marketable quality from the majority of these deposits by use of standard techniques. These techniques involved crushing, grinding, magnetic separation, froth flotation and, in some cases, acid leaching.(1)

HISTORY OF SOAPSTONE MINING

The soapstone deposits of Madison County occur in the Precambrian rocks of the Blue Ridge.(2) Figure No. 1 illustrates the general location of Madison County in relation to recognizable landmarks.

The first recorded production of talc or soapstone in Madison County was in 1868. Large blocks,15 feet by 20 feet, were quarried and hauled by wagon through the mountains to Greeneville, Tennessee, where they were used for iron furnace linings.(3)(4) Records are very sketchy, but apparently another period of production began in the late 1930's and continued into the last days of World War II. At least five mines were producing during the early 1940's.(5) The last activity in the district was in 1963, when attempts were made to reopen one of the old mines. Aside from local hearth stones, the soapstone was cut into talc crayons and ground into powder. Much of the World War II production was ground into foot powder for the Army at a mill in Marshall.(6) The mill building was demolished in 1968 or 1969.

Most of the records of production have been lost, destroyed, or are otherwise unavailable.

We have estimated that sporadic mining in the district has yielded perhaps 5,000 to 10,000 tons of soapstone. We further estimate that some of these mines may contain upwards of 1/2 million tons of talc remaining in the ground, with the possibility that the district may contain several million tons of soapstone. It is within these soapstone bodies that scheelite has been discovered.

HISTORY OF SCHEELITE DISCOVERY

In 1954 Mr. James H. Stewart of Asheville, while rock collecting at one of the abandoned Madison County soapstone mines, discovered scheelite. Mr. Stewart is a mineral collector and prospector by inclination. Mr. Stewart followed up his initial discovery by buying the mine and adjacent land. In search of other occurrences of scheelite, he examined other mine dumps and panned streams, checking for scheelite in the panned concentrates with an ultraviolet light. Scheelite has now been identified in six of the old soapstone mine dumps and has been observed in the sediment of many streams in the Big Laurel - Foster Creek section of Madison County.

OCCURRENCE

Scheelite has been observed in talc, chlorite, and biotite-rich rocks. It occurs as fine disseminated grains, crystalline masses as much as two and a half inches across, and veins up to one half inch thick. Other minerals so far identified are quartz, feldspar, breunnerite, chrome-bearing magnetite, tremolite, pyrite, apatite and molybdenite.

The largest masses of scheelite are apparently associated with the chlorite schist that comprises the wall rock of the soapstone bodies. Scheelite veins in the specimens we have seen are generally concordant with the foliation of the schist. In one sample we have observed a one-quarter-inch thick vein concordant with the foliation, and apparent fractures of the scheelite are filled with chlorite. In other samples we have seen similar cracks which are filled with chrome-bearing magnetite. Our information, however, is not yet complete enough to establish a paragenetic sequence.

The origin of the soapstone bodies has as yet not been determined, although only two interpretations are likely: 1) an altered igneous rock, or 2) an altered sedimentary rock. Examples of these alteration mechanisms

can be seen in the steatization of mafic intrusives, such as the talc - asbestos - serpentine - olivine deposits; and in the metasomatised sedimentary carbonate rocks, such as the talc deposits of the Murphy marble belt of North Carolina.

Table No. 1 lists some of the data bearing on the origin of the talc. There is a striking similarity in the Mg:Mg+Fe ratios in the talc, breunnerite, and tremolite in these deposits, and the Mg:Mg+Fe ratios of the olivines in the many North Carolina dunite deposits. In addition there is a substantial quantity of chromium present in spinel-type minerals in these soapstone bodies. Scheelite is often considered a contact - metamorphic or hydrothermally formed mineral. However in this area there are no known granitic intrusives, and typical skarn-zone mineral assemblages have not been observed. Dunites are numerous in the Blue Ridge of North Carolina. However, the very fact that scheelite is present is strongly suggestive of an original limestone body. Supporting evidence is the presence of abundant breunnerite, a carbonate mineral; the talc contains an appreciable amount of fluorine, indicative of sedimentary origin; [7] the calcium content of the soapstones is 2.5 times that found in the Blue Ridge dunites; and the presence in the area of high calcium siliceous marble beds. Nickel has not been detected in the soapstone deposits, whereas it is present in small amounts in the North Carolina dunite bodies.

ECONOMICS

We feel that the economic potential of a scheelite deposit here is strongly dependent upon the origin of the talc. If these deposits were initially sedimentary, there might well have been large quantities of calcium present to have formed scheelite from invading tungsten-bearing solutions. If these deposits are of ultramafic origin, the quantity of calcium would have been very limited, and therefore scheelite mineralization would also have been very limited.

The talc bodies that are known to contain scheelite extend from the North Carolina - Tennessee State line southwestward for about four miles. Other talc bodies occur for at least another ten miles further southwestward. There are also a few known talc deposits to the northeast in Tennessee. The extent of scheelite mineralization, if any, in these bodies is unknown.

Molybdenum, an element commonly associated with tungsten deposits, has also been detected in the area. It occurs as molybdenite in two of the talc deposits and is present in sphene crystals at another nearby marble deposit. However, none of the scheelite we have examined contains detectable amounts of molybdenum.

Geologic maps in much of the North Carolina Blue Ridge are reconnaissance maps only.[2][4] Many of the soapstone deposits have never been shown on any maps. Even the mined bodies have not been mapped in detail. We feel that other soapstone bodies must exist in the district, and it is probable that scheelite occurs in some of them. The problem of locating, evaluating and understanding these deposits offers a scientific challenge as well as a potential economic reward for those who seek to solve it.

REFERENCES

1) Bentzen, Edwin H., "Soapstone in Madison County, N. C.," Minerals Research Laboratory Progress Report No. 71-13-P, 1971.

2) Hadley, Jarvis B. and Nelson, Arthur E., "Geologic Map of the Knoxville Quadrangle, North Carolina, Tennessee, and South Carolina," Miscellaneous Geologic Investigations Map I-654, U. S. Geological Survey, Washington, D. C., 1971.

3) Pratt, Joseph H. and Lewis, Joseph V., "Corundum and Peridotites of Western North Carolina," vol. 1, North Carolina Geological Survey, Raleigh, North Carolina, 1905.

4) Keith, Arthur, "Geologic Atlas of the United States, Asheville Folio, North Carolina, Tennessee," United States Geological Survey, Washington, D. C., 1904.

5) Murdock, Thomas G., "The Mining Industry in North Carolina from 1937 to 1945," Economic Paper #65, North Carolina Department of Conservation and Development, Raleigh, North Carolina.

6) Glenn, Francis T., Vice President Georgia Talc Co., Chatsworth, Georgia. Personal communication, October 28, 1970.

7) Ross, Malcom; Smith, William L.; and Ashton, William H., "Triclinic Talc and Associated Amphiboles from Gouverneur Mining District, New York," pp. 751-769, The American Mineralogist, vol. 53, May-June, 1968.

TABLE 1

	DUNITES OF THE BLUE RIDGE	SOAPSTONES OF MADISON COUNTY	SUGGESTS AN ORIGIN FROM:
$\frac{Mg}{Mg + Fe}$	WHOLE ROCK = 0.82 OLIVINE = 0.91	WHOLE ROCK = 0.82 TALC = 0.93	DUNITE DUNITE
CHROMIUM	CHROMITE	CHROME-BEARING MAGNETITE	DUNITE
DUNITES ARE ABUNDANT IN THE BLUE RIDGE			DUNITE
SCHEELITE	NOT REPORTED	PRESENT	SEDIMENT
CARBONATE	TRACES	ABUNDANT	SEDIMENT
FLUORINE IN TALC	LOW	HIGH	SEDIMENT
MARBLE AND QUARTZITE PRESENT IN LOCAL AREA			SEDIMENT
CALCIUM	CaO = 0.16%	CaO = 0.40%	SEDIMENT
NICKEL	0.3%	NOT DETECTED	SEDIMENT

FIGURE 1