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JOHNNY GULCH TALC DEPOSIT
MADISON COUNTY,
MONTANA

by and Floyd, 1912-

H. L. James

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INTRODUCTION

The Johnny Gulch talc deposit, Madison County, Montana, is in sec. 4, T. 9 S., R. 1 W., a homestead section owned by Lewis Clark of Ennis, Montana. The mineral rights of the section are under lease to L. F. Teutsch, also of Ennis, who has been operating the property on a small scale since September, 1942.

The area, in the low foothills west of the Madison River, is of moderate relief and practically barren of timber or brush. It is about 24 miles by road from the town of Ennis and 40 miles from the nearest railroad shipping point at Norris, Montana. Snowfall is heavy from October until April; during this period the last three miles of road to the property are frequently impassable.

Most of the Johnny Gulch talc is of ceramic grade which is ground and shaped before firing, but particular interest is attached to small bodies of block talc ("lava grade") which is equal or superior to the best imported material. Block talc, which may be machined directly to the required shape and fired without cracking, yields a product possessing dielectric qualities superior to any substance known at the present time. To date, approximately 250 tons of ceramic talc and about 30 tons of lava talc have been mined. The ceramic talc has been sold to the American Lava Corporation of Chattannoga and to the Metals Reserve Corporation. The lava talc has been sold to the American Lava Corporation and to the Kirchberger and Co., Inc., Brooklyn, New York.

The field work on which the present report is based was done between October 17 and October 27, 1943, by the writer assisted by P. I. Conley. Previous Geological Survey examinations were made by R. M. Garrels in August, 1942, and by H. L. James in January, 1943. A War Minerals Report (No. 178) on the deposit was published in May, 1943, by the Bureau of Mines.

GENERAL GEOLOGY

The greater part of the area mapped is underlain by fine-grained, gray dolomite of the Precambrian Cherry Creek series. The dolomite shows a banding or shearing, particularly evident on weathered surfaces, which throughout the mapped area trends northeast with a steep westerly or nearly vertical dip. Although not entirely definite, it is believed that this structure represents original bedding with shearing parallel to the bedding.

Locally the dolomite has been extensively altered to coarse-grained, secondary carbonates which include cream-colored, red-weathering siderite, dolomite, and colorless, manganiferous ankerite. The ankerite usually occurs in vugs in siderite rock as large crystals up to one inch in diameter frequently coated with small crystals of quartz or calcite. The secondary carbonate zones follow, in a general way, the northeast structural trend but in detail may be seen to crosscut at any angle. Very deep weathering of siderite-ankerite rock in the vicinity of pit No. 9 has resulted in a thick gossan of manganese and iron oxides with "boulders" of dark red, jaspery silica.

The talc deposits occur as lenticular replacements of the dolomite, occasionally, but by no means invariably, associated with the secondary carbonates. Most of the lava grade talc mined has been taken from the deeply weathered siderite-ankerite zone near pit 9.

The dolomite and talc are unconformably overlain by rhyolite and rhyolite tuff of much younger age, probably equivalent to the Tertiary rhyolites of Yellowstone Park. These rocks crop out in the area west and northwest of the camp and dip eastward at a low angle. From the outcrop pattern, it appears that these volcanic rocks filled a topographic depression or valley in the pre-rhyolite land surface. Possibly the very deep weathering on the spur near pit 9 is pre-rhyolite in age, since no zone of comparable weathering was noted elsewhere on similar areas of sideritic rock. Masses of dull-yellow, opaline silica on the south hill are probably related to the volcanic activity.

TALC DEPOSITS

General

Talc lenses of commercial and sub-commercial size are found in dolomite along a northerly trending belt several miles long in the foothills west of the Madison River. In the Johnny Gulch area, the lenses are as much as 70 feet or more in length and 35 feet in width but most are considerably smaller. The two grades of talc — lava and ceramic — appear to be more or less mutually exclusive although several exceptions to this are found in the Madison tunnel-pit 9 zone. In general, the lava talc lenses are smaller and more irregular than those of ceramic grade, and most of those known are associated with intense siderite-ankerite alteration of the dolomite. The bodies of ceramic talc are much more numerous, larger, and (with minor exceptions) associated with but negligible secondary carbonate alteration of the dolomite wall rock.

Two general trends of talc lenses were noted. In the pit 5 area, including the upper and lower adits, the strike of the talc lenses ranges from N. to N. 40° W. while in the Madison tunnel-pit 9 zone, the strike is northeast and appears to be generally parallel with the northeast structure of the dolomite.

Appearance and Composition

In physical appearance the talc is very fine-grained and varies from translucent to opaque. The color ranges from light green through bluish-white to cream or even buff. Much of the talc is shot through by dendritic manganese undoubtedly derived from weathering of the manganiferous ankerite.

Talc suitable for block talc (lava) purposes is opaque, dull white to creamy white, and completely free from cracks. Most of the ceramic grade talc is greenish, definitely translucent, and cut by many hairlike fissures. Gradational types do not seem to be common. As shown by the following analyses, the talc, despite strong differences in physical properties, varies little in chemical composition.

Analyses of Johnny Gulch Talc[1]

	SiO_2	Fe_2O_3	Al_2O_3	CaO	MgO	Na_2O	K_2O
Pit 5 (ceramic)	61.70	1.29	1.55	tr.	32.44	0.37	0.46
Pit 7 (ceramic)	61.29	1.36	1.34	tr.	31.26	0.26	0.33
Pit 9 (lava)	61.76	1.33	1.51	tr.	31.95	0.27	0.32

According to a personal communication from Dr. Hans Thurnauer (American Lava Corporation) to L. F. Teutsch, the lava grade talc is of noticeably lower specific gravity than the ceramic grade. The ability of the lower density talc to fire without cracking, Thurnauer believes, is due to its more open structure which permits escape or steam without physical rupture of the rock.

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[1] Analyses by Wiley and Co., Inc., Baltimore, Md., for Clinchfield Sand and Feldspar Corporation.

Globular structure, frequently with interstitial ankerite, is not uncommon in the greenish, ceramic talc but has not been noted in talc of lava grade.

Distribution and Development

For purposes of description the talc deposits can be conveniently separated into three areas as follows: the No. 9 area, including the No. 9 adit, the shaft, pit No. 2, and the Madison tunnel; the No. 5 area, including the upper 5 and lower 5 adits; and the south hill which includes all trenches and showings south of the main east-west gulch. Practically all the lava talc has been taken from the No. 9 area, although some is present in both other areas.

No. 9 area: Development in the number 9 area consists of a 20-foot shaft, the No. 2 open pit, about 400 feet of underground drifting in the No. 9 and Madison adits, and several small pits. Much of the underlying rock of this area is made up of siderite and ankerite which, on the crest of the spur, has been leached to a depth of at least 30 feet to a soft but compact mass of iron and manganese oxides in which lumps of block talc as much as 200 pounds in weight have been found. The No. 9 adit cuts through talc-bearing dolomite into the soft gossan from which the lava talc has been taken. The lava talc is not entirely limited to the zone of siderite alteration, as some of the talc in the footwall dolomite is of lava grade. However, it has not been found practical to mine this lava because of the obvious difficulties involved in taking out thin lenses of talc from a massive country rock without inducing incipient or actual fractures. The main production of lava to date has been taken from a pocket several feet wide and perhaps 30 feet long in the gossan.

The shaft was started on a showing of lava talc in weathered siderite and passed into a footwall of dolomite. A short drift to the west cuts back into the weathered siderite from which a small quantity of lava talc has been taken. The talc is in small, highly irregular seams and bunches.

Pit No. 2 was opened on a lens of talc, largely of ceramic grade, in dolomite. A thin lens of lava talc is present, however, in the face of the cut, and a few pieces of lava were found in the float rock near the south end of the pit. The Madison tunnel was driven to intersect the main talc zone 45 feet vertically below the open pit. Because of the westerly dip, however, the adit was in barren siderite rock and east of the probable talc for most of its length. Except for one or two very small lenses of lava grade, the talc encountered was of poor ceramic quality.

No. 5 area: Two short adits have been driven on lenses of ceramic talc in the No. 5 area. The lower adit was opened on an outcrop of talc 35 feet wide and about 50 feet long, and is in solid talc for its entire length. The upper adit is in talc for about 55 feet.

A small pit east of the lower 5 portal has been opened on cream-colored talc of lava grade in a narrow zone of secondary carbonate alteration. Barren dolomite crops immediately to the northeast and the only possibility of extension is to the south. Croppings of secondary carbonate rock near the ore bin contain thin pods of lava talc but nothing of mineable width is exposed.

South Hill: Talc is exposed in several pits and shallow trenches in the south hill area, but the only occurrence of possible lava grade is in pit No. 14, where a small pod about 4 feet long and 3 feet wide is almost completely exposed. Little possibility exists for extension of the pod in any direction.

Ceramic talc is exposed in a number of trenches and in the outcrop. The most promising exposures would appear to be those of No. 11 and No. 16 trenches where a width (?) of 80 and 70 feet respectively is indicated. The trend and shape of these talc bodies is unknown, but it would appear that large bodies of ceramic talc are present.

RESERVES OF LAVA TALC

The distribution of lava grade talc is so spotty and the lenses themselves so irregular that no attempt can be made at the present time to estimate reserves. The only single large pod -- that in the pit 9 area -- has been almost completely taken out. From a practical standpoint, serious mining difficulties may be expected below the lower limit of the deeply weathered zone, and it may prove nearly impossible to mine narrow lenses contained in unweathered siderite or dolomite without shattering the talc blocks. Many small lenses are present in the No. 9 area and some may prove mineable.

The two small pods of lava grade in the No. 5 and South Hill areas, at the present time, give little promise of substantial extension beyond those parts exposed.

RECOMMENDATIONS FOR EXPLORATION OF THE LAVA TALC

The usual association of lava grade talc with siderite-ankerite alteration of the dolomite appears to be the only general guide to exploration, and there are a number of exceptions to this generalization. Narrow lenses of lava grade are found in dolomite in both the No. 9 adit and in the No. 2 open pit, although both occurrences are probably within 20 feet of siderite-ankerite alteration. Conversely, there are large areas of secondary carbonates without talc of any sort.

Practically all the lava talc mined thus far has been from the No. 9 pit and adit where mining of unbroken lumps has been relatively easy in the gossan. The favorable combination of a lava talc zone and very deep weathering makes the spur northwest of the shaft the most promising area for prospecting designed to develop mineable talc in the shortest possible time. The proposed Bureau of Mines shaft from the No. 9 adit should penetrate to the bottom of the weathered zone in a known lava talc belt and make possible considerable underground development. Surface stripping in this zone by bulldozer or slusher would probably reveal lava talc that could be mined while the shaft is being sunk.

Further development of the No. 9 area will hinge partly on information gained by sinking the shaft. At present, the most obvious direction for further exploration, beyond that of the weathered zone, would be from the Madison tunnel, which is 77 feet lower in elevation than the No. 9 adit. Approximately 100 feet of drifting would put the face of the adit directly below the present No. 9 workings.

Bulldozer scraping of parts of the south hill area, particularly the northeast-facing slope, might possibly reveal some lava talc.

The recommendations for exploration, in order of precedence, may be summarized as follows:

1. Sinking of proposed shaft from the No. 9 adit with north-south drifting along the base of the weathered zone.

2. Bulldozer or slusher scraping of the spur northwest of the shaft.

3. Driving of the Madison tunnel about 100 - 150 feet to the north to intersect the No. 9 lava talc zone.

4. Bulldozer scraping on the north side of the south hill.