GEOLOGY AND ORE DEPOSITS OF PART OF THE PLACERVILLE DISTRICT, SAN MIGUEL COUNTY, COLORADO

By Verl R. Wilmarth and Charles C. Hawley

Trace Elements Investigations Report 253

DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON 25, D. C.

November 26, 1958

AEC - 158/9

Mr. Robert D. Nininger
Assistant Director for Exploration
Division of Raw Materials
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Bob:

Transmitted herewith are three copies of TEI-253, "Geology and ore deposits of part of the Placerville district, San Miguel County, Colorado," by Verl R. Wilmarth and Charles C. Hawley, October 1958.

This report is an abstract of a paper with the same title that is planned for publication as a Geological Survey bulletin. A copy of the entire report is in the TEPCO files.

Sincerely yours,

John H. Eric

for W. H. Bradley
Chief Geologist

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

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This preliminary report is distributed without editorial and technical review for conformity with official standards and nomenclature. It is not for public inspection or quotation.

*This report concerns work done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

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GEOLOGY AND ORE DEPOSITS OF PART OF THE PLACERVILLE DISTRICT, SAN MIGUEL COUNTY, COLORADO

by

Verl R. Wilmarth and Charles C. Hawley

Abstract

Ore deposits of the Placerville area have yielded more than 6,000 tons of vanadium oxide from deposits in the Entrada sandstone of Late Jurassic age. Small quantities of uranium ore were recovered by hand sorting from the vanadium ores but it was not until 1950 that fissure vein deposits in the Cutler and Dolores formations were mined for uranium. Uranium production from the veins, though not known accurately, is probably small.

The rocks in the Placerville area are flat-lying, complexly faulted sedimentary rocks of Permian to Cretaceous age that have been intruded by clastic and basalt porphyry dikes of Tertiary(?) age. Three main fault systems that cut the rocks have been recognized; (1) northwest-trending, steeply dipping, normal faults that contain small vein deposits; (2) north-trending, steeply dipping faults containing abundant calcite veins; and (3) northeast-trending, steeply dipping faults that are not extensively mineralized.

Ore deposits in the Placerville area include vanadium-uranium deposits in the Entrada sandstone, and vein deposits along the northwest-trending faults that have been mined for copper and uranium.

The vanadium-uranium deposits consist of roscoelite and minor quantities of carnotite in ore bodies as much as several hundred feet long and 20 feet thick, in the upper 25 feet of the Entrada sandstone. The ore averages 2.5 percent V_2O_5 and 0.05 percent uranium.

Vein deposits in the northwest-trending faults were formed by fissure filling and replacement of favorable sedimentary rocks along the faults. The veins are grouped on basis of mineralogy as asphaltite-copper sulfide deposits exploited for uranium and copper and calcite-barite-asphaltite veins that are not commercial.

The asphaltite-copper sulfide veins are composed mainly of fault gouge cut by calcite and barite veins. The ore minerals, tetrahedrite-tennantite, chalcopyrite, bornite, and uraniferous asphaltite, occur as nodules, lenses, veinlets, and irregular masses widely distributed through the vein and at one locality uraniferous asphaltite occurs in the wall rocks for as much as 90 feet from the fault zone. Minor quantities of galena, sphalerite, pyrite, skutterudite, and molybdenite are associated with the ore minerals. The vein deposits are discontinuous. They range from 2 to 20 feet in width and are traceable along outcrop for as much as 300 feet. Channel samples of the vein material assay as much as 6.37 percent copper and 0.70 percent uranium. Selected samples of the asphaltite contain as much as 9 percent uranium.

At least 3 stages of mineral deposition have been noted in the vein deposits: (1) calcite, quartz, and barite; (2) pyrite and uraniferous asphaltite; (3) tetrahedrite-tennantite, chalcopyrite, bornite, galena, fuchsite, sphalerite, and minor molybdenum and cobalt sulfides. Most

of the uranium is in the asphaltite but some is in secondary autunite and uranophane. The uranium content of the asphaltite ranges from 0.0003 to 9 percent and is contained in coffinite, uraninite, and black carbonaceous material.

The veins are characteristic of the epithermal type and their mineralogy indicates that the early ore solutions were alkaline and probably had a temperature of about 180° C. Later, prior to the deposition of barite, pyrite, and sulfide and sulfosalt minerals, the ore solutions became acidic and the temperature was below 100° C. The uraniferous asphaltite is believed to have been derived from crude oil of unknown source rock that was carried up along the faults as an immiscible liquid in the ore solutions. In this process the lighter volatiles were removed through heat and chemical reaction and the asphaltite part was solidified. Most of the uranium in the asphaltite of the asphaltite-copper veins is believed to have been derived from the ore solutions by selective absorption of the uranium.