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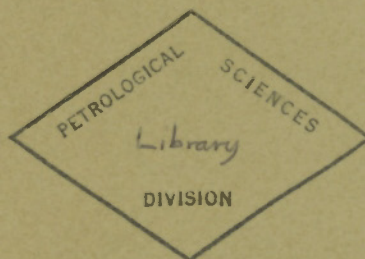
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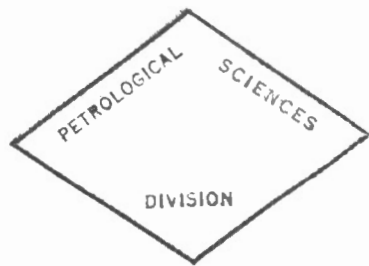
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PAPER 61-4

POLLUCITE (Caesium) IN CANADA

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INTRODUCTION

This brief account is in response to numerous enquiries regarding caesium, its minerals, and prospecting possibilities in Canada. A substantial deposit of high-grade pollucite has been blocked out at the mine of Chemalloy Minerals Limited at Bernic Lake in southeastern Manitoba and a minor amount has been found at the Valor property in Lacorne tp., Abitibi county, Quebec. Current markets are limited, in terms of available supplies, but the possibilities of considerably expanded demand in the future are considered good.

PROPERTIES, USES, AND PRICES

Caesium is the heaviest of the alkali group of metals. It is a silvery-white soft metal that reacts violently with air or water.

Due to its sensitivity to visible light, and parts of the infrared and ultraviolet spectra, caesium is used in various photoelectric devices. These include photomultiplier tubes and infrared lamps, telescopes, and spectrometers. It is used in vacuum tubes, scintillation counters, frequency and time standards, in ceramics, analytical procedures, and chemical and metallurgical processing. Caesium radioisotopes have a number of potential uses. Thermoelectric power plants of the plasma-thermocouple and thermionic types employ caesium, and it may eventually be used as a fuel in ionic-drive rocket engines.

According to Barton (1960)¹ caesium metal in 1958 was priced from \$1.10 to \$5.00 a gram, technical-grade compounds from \$22.50 to \$27.50 a pound, and CP-grade compounds from \$0.40 to \$1.00 a gram. Pollucite ore or concentrate containing 25 to 30 per cent Cs₂O was valued at about \$0.50 a pound in 1957. According to Brinsmead (1960) pollucite was offered by Chemalloy at as low as 15 cents per pound at the mine in 1960. There is no U.S. import duty on the ore, but the metal is dutiable at 21 per cent, and caesium chloride at 12 1/2 per cent (Barton, 1960).

PRODUCTION AND CONSUMPTION

Southern Rhodesia and South-West Africa, the principal world suppliers, have produced less than 100 tons of pollucite annually, with shipments of less than 15 tons annually to the United States and Europe. No pollucite has been produced in the United

¹

Dates in parentheses refer to publications listed in the References.

States recently. Most of the 1958 production of caesium and its compounds was from ALKARB, made by San Antonio Chemicals, Inc., San Antonio, Texas as a by-product of lithium extraction from lepidolite. ALKARB contains about 2 per cent caesium carbonate. Less than 1 ton of pollucite was consumed by the U.S. domestic caesium industry. In West Germany two companies produce caesium compounds from African pollucite (Barton, 1960).

MINERALOGY

Pollucite ($2\text{Cs}_2\text{O} \cdot 2\text{Al}_2\text{O}_3 \cdot 9\text{SiO}_2 \cdot \text{H}_2\text{O}$) is the principal primary mineral of caesium, and contains about 27 per cent Cs_2O . Its hardness is 6.5 and specific gravity 2.901. It is isometric and occasionally occurs in cubes but is generally massive. It is colourless to white, or greyish or pinkish white with a vitreous lustre, and may closely resemble quartz. However, the Chemalloy and Valor material commonly contains numerous veinlets of white material, part of which is fine-grained spodumene, and also characteristically has veins and patches of fine-grained purplish lepidolite. At the Valor property, where the pollucite is exposed on the surface, it has a dull greyish white weathered surface with a rough texture, in which the white veinlets are visible.

Rhodizite—a rare hydrous borate of aluminium, beryllium, and alkalis, found in the Urals and Madagascar—commonly contains some caesium. Lepidolite also contains variable minor amounts and is an important commercial source of by-product caesium (see above).

Field Test for the Detection of Caesium

This simple and effective chemical field test is reproduced by permission of the Manitoba Department of Mines and Natural Resources. The test is based on the reaction of caesium with potassium bismuth iodide (—Feigl).

Equipment and reagents required:

One 2-oz, clear polyethylene bottle with polyethylene dropper-insert and polyethylene or polystyrene screw-cap (see Cat. #3004 Fisher Scientific Catalogue).

One 2-oz, brown polyethylene bottle, similarly equipped. (A clear bottle may be used if painted or otherwise covered to exclude light.)

Reagent #1 (in clear bottle)
Concentrated hydrofluoric acid.

Reagent #2 (kept in brown bottle)
Prepare a saturated solution of 5 grams of reagent-grade potassium iodide by adding distilled water a drop at a time to the 5 grams of KI in a small beaker, until just dissolved. Add 1 gram

of bismuth oxide (Bi_2O_3) and boil gently for a few minutes. Most of the Bi_2O_3 should dissolve. Add this mixture in small increments to 25 ML glacial acetic acid contained in a small beaker, shaking to dissolve. Pour the solution into the brown polyethylene bottle and replace dropper-insert and cap.

Procedure:

By means of the dropping bottle, place a drop of reagent #1* on the rock or mineral, followed by 1 drop of reagent #2.

A bright red precipitate will form on pollucite (caesium mineral). Quartz, feldspar, etc. show only amber stains easily distinguished from that on pollucite.

MODE OF OCCURRENCE

Pollucite occurs in some complex, generally well-zoned pegmatites that are rich in lithium minerals, notably lepidolite. This assemblage is present at the Chemalloy and Valor occurrences, also at Bikita, Southern Rhodesia, at Varutrask, Sweden, at East Kazakhstan, Central Asia, at the Newry and other pollucite occurrences in Maine, and elsewhere in the United States. The mineral composition differs in detail from one to another of these occurrences, but lepidolite is present at all. Lepidolite and cleavelandite—the platy form of albite—are supposed to indicate late-stage pegmatitic activity, which is probably a necessary condition for the occurrence of pollucite. Beryl is present at most if not all occurrences and may indicate that a prolonged period of concentration of material, from early to late stage, is necessary.

At the Chemalloy (formerly called 'Montgary') property in southeastern Manitoba (Hutchinson, 1959; Brinsmead, 1960), pollucite occurs in a lenticular mass or unit nearly 500 feet long and up to 60 feet in maximum thickness, a large part of which is nearly pure pollucite. The pollucite unit is gently dipping and, in general, concordant with the overall attitude of the pegmatite in which it occurs. It is in the upper-central part of the pegmatite body, which is distinctly zoned, and is bounded above and below for the most part by spodumene-rich assemblages. It is associated with, but not confined to, quartz and quartz-amblygonite bodies that represent a core unit. Cleavelandite - lithia-mica assemblages commonly rim the quartz-amblygonite bodies, and lepidolite-albite and petalite assemblages occur in the same general zonal relationships. Beryl and tantalite occur rather prominently in parts of a lower-central albite-rich zone, and scattered beryl crystals are found in outer zones near the tourmaline-rich borders.

*CAUTION: Hydrofluoric acid, if allowed to come in contact with the skin, produces burns that are painful and slow to heal. Glacial acetic acid also produces burns. Antidote: flush affected areas with copious quantities of water as soon as possible after contact with either reagent.

At the Valor property, in Lacorne tp., Quebec, masses of pollucite up to 5 feet in maximum exposed dimension are scattered through part of the lenticular core zone of a complex zoned dyke. This zone consists chiefly of quartz, cleavelandite, and spodumene, with irregular masses and disseminations of lepidolite. Beryl also occurs here and there in the core but is more prominent in the core selvages, and in a surrounding feldspar-quartz-muscovite pegmatite-aplite assemblage.

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