HOME STUDY PAGE

(Conducted by the Editor)
Contributions invited.— Length about 500 words.

STRATEGIC MICA

By Ian Campbell, Pasadena Calif.

"In modern warefare mica is truly indispensable".[1] "No other mineral combines in itself so many desirable properties for the qualifications imposed by the electrical industry."[2] These two recently published statements give some indication of the importance of mica to the United States at war. Among the nonmetallic minerals, possibly only quartz is more critical today.

Like quartz, mica is an exceedingly common mineral. Muscovite (white mica) which is the most important variety commercially, is abundant in many metamorphic rocks, especially in the mica schists; it is a prominent constituent of some sandstones and many shales; and it is present in a few granites and granite pegmatites. Only the last furnish mica of the size and quality needed for strategic purposes.

What are the unusual features of mica that make it such an important mineral? Outstanding is its dielectric strength; it is in fact the best insulator known. Films of either muscovite or phlogopite (amber mica) only one thousandth of an inch thick can withstand up to 5000 volts without puncture when tested between spherical electrodes. This makes it particularly valuable for condenser plates and countless other electrical uses. Another feature, unique in the mineral world, is the combination of flexibility and elasticity possessed by thin cleavages of mica. Most minerals when bent, will break; some when bent will stay bent; only mica will spring back into shape. Thus a mica used in aviation spark plugs can be trimmed to a film scarcely more than one thousandth of an inch and rolled around a one-eighth inch spindle without cracking or tearing. Mica is heat resistant; muscovite withstands temperatures of over 500 degrees C. without a change. Tus phlogopite is preferred for aviation spark plugs and other uses where electrical insulators are exposed to high temperatures. Mica has an exceptionally perfect cleavage, which permits preparation of sheets as thin as a thousandth of an inch and yet as much as 8x10 inches in lateral dimensions. Furthermore, mica is a relative soft mineral and thus patterns of many intricate shapes can be readily cut and punched to close tolerances from sheets of desired thickness. It is transparent and is therefore adaptable to many uses where glass would prove a failure. Finally, it is a mineral of considerable chemical stability and is highly corrosion resistant.

The combination of all these desirable qualities makes mica a unique material, and small but vitally necessary sheets of mica are in every plane and tank and battleship and jeep that we make; in all our far flung communications systems, mica enters at countless points. Indeed, wherever we use electricity, we use mica.

The mica must satisfy certain strict specifications of which one of the most important is size. Unless mica occurs in sheets of 1x1 inch or larger, it is of no "strategic" value. And value increases rapidly with increase in size of sheets. Thus 1x1 inch sheets sell for around 50 cents a pound; 2x2 inch sheets for $1.75 per pound; and 6x6 inch sheets for $8.00 per pound. These figures also indicate the importance of careful mining and preparation of mica in order to conserve the largest possible sheets.

The Unites States commonly produces all of the smaller sizes of mica (classed as "ground," "scrap." etc.) that we need; but of the larger sizes (known as "sheet" or "block" mica) we have never, even in pre-war years, been able to satisfy our needs from domestic production, and have imported the bulk of our requirements from India (muscovite) and Madagascar (phlogopite).

Various agencies are today engaged in stimulating domestic production of the strategic grades of mica, and exploration for additional sources is under way. Because all of the better grades of mica seem to be confined in their geologic occurrence to pegmatites (muscovite in granitie pegmatites, phlogopite, in basic, i.e., quartz-free pegmatites) and because even within a pegmatite, mica tends to occur in more or less isolated "books", the individual prospector and mineral collector can do relatively more to help in the discovery and development of new deposits than is the case with many other mineral products, and at a price of $8.00 per pound for the highest grades, the rewards for successful exploration may be large.

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[1] Lawrence G. Houk, U.S. Bureau of Mines, Inf. Circ. No. 7219, 1942.
[2] Alan M. Bateman, Economic Mineral Deposits, 1942.

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CUTTING AND POLISHING

The usually followed techinque of cutting a cabochon is freehand, holding the undopped stone in the fingers, base toward the operator as the basal outline is cut, meanwhile shaping the bevel or crown by rolling the stone upward and working toward the edge of the wheel to minimize grooving. Grooving can be greatly reduced, or eliminated almost entirely, if the operator instead of making the basal outline first will grind all straight edges inward roughly through the crown, thus utilizing the entire cutting surface of the wheel instead of more or less gouging at the center as is the case of the elliptical stone. After the stone has been roughed out in this manner the corners can be knocked off with ease and speed and the elliptical outline perfected.

—(Nathalie Forsythe)

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