The Spruce Pine Mining District

A Brief Review of the History, Geology and Modern Uses of the Minerals Mined in the Spruce Pine Mining District

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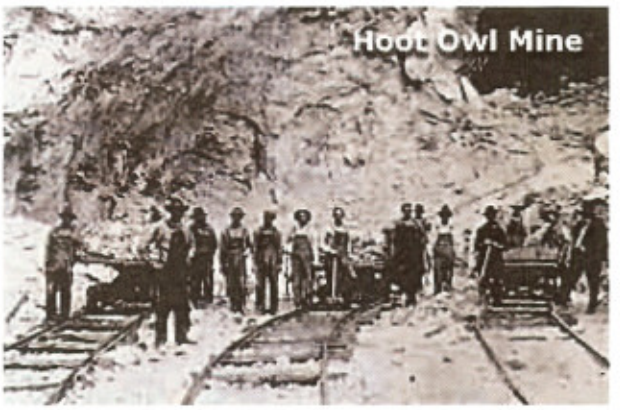
It is amazing that this small 25 mile long by 10 mile wide batholith of the Spruce Pine Mining District (lying in Mitchell, Avery, and Yancey Counties of North Carolina) is so important an ingredient for making products we use everyday. We often take for granted its role in the quality of life that we enjoy today.



The Spruce Pine District's importance has increased as mankind's need for minerals has progressed from early native American burial decoration to space-age computer parts of today. Even more amazing is the fact that it took colliding continents to place this valuable resource in such a beautiful area as the western North Carolina mountains.

HISTORY

The story of prospecting and mineral production of the Spruce Pine Mining District began before recorded time when the "Ancients" mined for glittering mica during the Woodland age 2000 years ago. The Ancients, an early name given to the Native Americans by settlers of the area, mined mica for grave decoration and wampum which they traded as money. The mica is known to have been traded as far away as the Ohio valley and is believed to have originated from Native American mines in the spruce Pine area now known as the Clarissa, Ray, and Sinkhole mines. Legend is that this mining of mica led Hernando DeSoto to the Spruce Pine area around 1540 in search of mineral wealth that he thought to be gold and silver. He found only silver mica better known as muscovite mica.

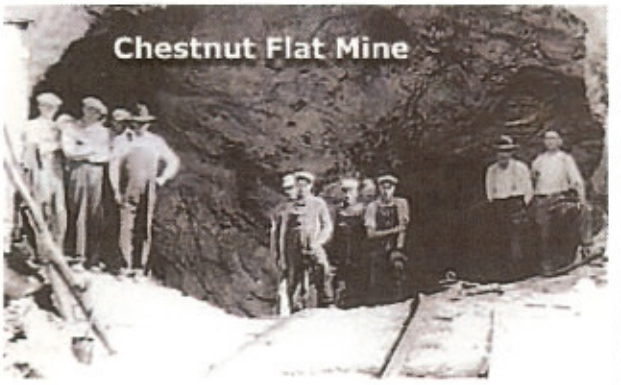
Later, around 1744, legend is that Cherokee Indians mined semi-weathered feldspar and kaolin from the Spruce Pine pegmatites and used oxen-drawn sleds to transport it to the coast where it was loaded on ships bound for England. In England, it was used as an ingredient for patented English ceramic wares.

From 1767 to 1911, mining of feldspar and mica occurred sporadically. Mica was mined to fuel the demand for the newly-developed Edison electric motor in 1878. The motor required the electrical insulating properties of sheet mica.

Around 1910, gem prospector William E. Dibbell of Baltimore became interested in the large waste piles of feldspar discarded by the early mica miners. He sorted material from the Flat Rock Mica mine near Penland and hand-scrubbed it with steel brushes to enhance purity for trial shipment to the Golding Sons Ceramic Plant in East Liverpool, Ohio. Management of the Golding Sons Plant liked the ceramic grade feldspar so much that they contracted Dibbell to supply more. This led to Dibbell receiving bank backing to organize the carolina Minerals Company of Penland. The first production load of feldspar was shipped from the Deer Park mine in 1911 and eventually supplied Golding Sons ceramic plants in Trenton, Wilmington, and East Liverpool, Ohio.

Three years later, in 1914, felspar grinding plants were built in Erwin, Tennessee by the Clinchfield Mineral and Milling Company. This plant was organized by Charles Ingram and financed by Blair and Company of New York. This same company financed building of the Clinchfield railroad, which was completed in 1908.

In 1917, North Carolina became the primary feldspar producer in the U.S. and has continued to maintain that status ever since. Feldspar grinding continued in Erwin, Tennessee along with new feldspar plants constructed in 1921 at Beaver Creek, North Carolina and in 1923 at Micaville, North Carolina. As the feldspar industry became more active and prosperous, many investors and producers were starting new companies and buying others. Feldspar and mica were being hand-mined at hundreds of holes, pits, and mines throughout Mitchell, Avery, and Yancey Counties, which make up the Spruce Pine Mining District.



Until the mid- to late-1940s, most work, especially ore separation of minerals, was done by hand with crude machinery and hand tools. Between 1944 and 1949, the process of chemical separation of minerals was jointly developed by the Feldspar Mining Company, the North Carolina Feldspar Corporation, the Tennessee Valley Authority, and the

Carolina Feldspar Corporation, the Tennessee Valley Authority, and the North Carolina State Mineral Research Laboratory of Asheville. This process led to the current large volume, high-capacity process of separating the minerals of feldspar, mica, quartz, and garnet from the rock (ore).

GEOLOGY

The geologic history of the Spruce Pine Mining District is as fascinating as its mining history. About 380 million years ago, the African Continent was being forced toward the Ancestral Eastern North American Continent by plate tectonic force. The subduction, or forcing down of the Oceanic Crust underneath the North American Continent produced tremendous friction-generated heat from the two colliding continents.

This friction-generated heat in excess of 2,000 degrees Fahrenheit melted the surrounding rock 9 to 15 miles below the surface. This igneous molten rock was generated under intense pressure that forced the molten rock into cracks and fissures of preexisting rock. This molten rock under pressure is similar to hot hydraulic fluid being forced into a chamber. Due to the pressure exerted on the molten fluid, it hydraulically pushed its way through the cracks of the host rock. this opened the rock up, along with melting contact areas of the host rock and sucking up rich mineral forming fluids. As these cooled, they crystallized and became a mineral-rich buried treasure.

It then took an estimated 100 million years for this deeply buried (and insulated) mass to cool and crystallize. The slowly cooling mineral crystals grew within the Spruce Pine District to some of the largest feldspar and mica crystals in the world. After molten emplacement and cooling, it took millions of more years of Appalachian Mountain building and subsequent erosion to expose the deposits we see today.

TODAY'S USES

Modern day mining methods, research, plant production, and product development have enabled the use of these high purity natural resources from the earth to enhance our quality of life.

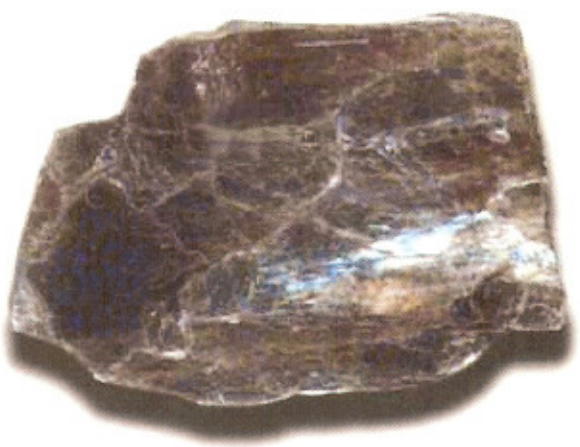
FELDSPAR

Feldspar is a major ingredient in

the manufacture of many types of glass, from automobile windshields and computer screens to baby food bottles and electric light bulbs. Feldspar comprises about 65% of the rock from the Spruce Pine pegmatite and is a major source of aluminum, sodium and potassium for glass manufacturing. Feldspar provides aluminum, which improves glass workability during forming, retards glass blooming, improves glass strength and imparts resistance to thermal shock. About 110 pounds of feldspar is used to make a ton of container glass (bottles and jars) and about 100 pounds is used to make a ton of flat glass (auto windshields and window glass).

Feldspar is also a major ingredient in the manufacture of ceramic products. it acts as a flux to fuse (melt) other ingredients at lower temperatures; it cements the crystalline phases of other ingredients together; and it imparts strength, durability, and toughness to ceramic bodies. Feldspar's special qualities and glazing properties allow ceramic product manufacture of pottery, plumbing fixtures (sinks and toilets), electrical porcelain, ceramic tile, dinnerware, structural ceramics, art pottery, planters and much more. The use of feldspar in the manufacture of ceramics has come a long way since its development during the Tang Dynasty of China around A.D. 621 to 945.

MICA



Mica, another ingredient from the rock of the Spruce Pine Mining District comprises about 10% of the rock mass. Once highly valued for wood- and coal-burning stove windows (often called isinglass) and for radio tube insulators during both world wars, it is now used as an industrial products special additive.

Muscovite, which is silver to white mica variety, is mostly ground to a fine particle size. It is valued for its flat particle shape. It is used mostly as a major ingredient of drywall joint compound or sheet rock joint cement. Muscovite's flat particle shape and light color allow it to serve as an anti-shrinking agent for the cement after it is applied to sheet rock joints. It applies as smooth, damp putty, but because of muscovite mica's flat particle shape, it interlocks the mud as it dries, therefore reinforcing the mud as

it dries, without shrinkage. It also acts as a fire retardant within the sheet rock joint.

Mica is also produced from the Spruce Pine Mining District for use as special electrical insulators, automobile metallic flake paint, women's make-up, and as a reinforcing additive in special plastics and paints. It is used in oil well drilling fluids to seal and lubricate the bore hole during drilling.

QUARTZ

Another major ingredient of the Spruce Pine rock is quartz. Through the years, quartz was always discarded as waste. Now it is recovered through froth flotation and is used as industrial sand in concrete and concrete mortar. It is also a highly-valued white golf course trap sand and is sold across the country to the finest golf courses, including the Augusta National, the host for the Masters.

Comprising about 25% of the rock, the quartz has now become one of the most strategic minerals of the entire world. Because of its extreme purity, it is used in several critical process steps during the manufacture of computer semiconductors (chips). At present, no other quartz in the world can match the processed quartz purity from the Spruce Pine District. As a matter of fact, EVERY computer chip in the world uses Spruce Pine quartz in its manufacturing process.

Also of high value to the lighting industry, the Spruce Pine quartz meets stringent purity requirements to serve as extreme high temperature light tubing required for light bulbs installed in automobiles, streetlights, and film projectors.