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Graphite in Texas

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Graphite is carbon or carbon with impurities. It occurs in the form of flakes or small foliated masses, lumps, and in an impure earthy form. Rarely, it is found in six-sided tabular crystals. It is black, soft, and greasy in appearance. A rock containing graphite when rubbed becomes shiny at the surface and the mineral, being soft, stains the hands. It is not uncommonly a constituent of schists derived from sedimentary rocks. Under these conditions it is believed to have formed from the organic material of the original rock. Coal beds are at some localities changed to graphite. To a limited extent graphite occurs in altered limestones, in veins, in granite, and in meteorites.

In the market graphite is known as crystalline and amorphous. The crystalline graphite occurs in veins or lumps, and disseminated in the rocks, in which it is known as flake graphite. That found in schists is very largely or entirely crystalline. Even the so-called amorphous graphite is minutely crystalline or cryptocrystalline. The crystalline graphite usually commands the higher price. Artificial graphite is made in electric furnaces from anthracite or from petroleum coke. Most of it is made into electrodes, although it is used also in dry batteries. Aside from these uses it comes into competition with the cheaper grades of graphite including the amorphous variety and graphite dust.

Graphite, having good electric conductivity, resistance to acid and to high temperatures, finds many uses in the industries. Until recently the largest single use, 50 percent or thereabouts, was in the manufacture of crucibles. This usage, however, has declined to 15 percent or less owing to changes in melting steel and brass, electric and gas-fired hearth furnaces now being used.[1] Another very large use of graphite developed in recent years is in manufacture of dry batteries particularly for radio purposes. This demand, however, has declined since batteries for radio have been largely dispensed with, radios being connected with electric power systems. An important use for cheaper grades of graphite is for foundry facings which now consumes approximately 50 percent of domestic production.[2] Another use of graphite is in lubricants for which purpose it is usually mixed with oils. Low-grade graphite is used in making paint. Other uses are in manufacture of "lead" pencils, coating for boilers, graphite electrodes, electrotyping, stove polish, automobile generator brushes, shoe polish, and fertilizer filler.

The world production of graphite in 1928 was probably above 150,000 short tons. Of this amount the production in the United States was 5,611 tons of which 2,994 tons were amorphous and 2,617 tons crystalline.[3] The states producing crystalline graphite in order of quantity of production are Texas, Alabama, New Jersey, and Georgia. The graphite used in the United States approximates 20,000 short tons annually. The imports making up the large difference between the amount produced and the amount used are chiefly from Mexico, Ceylon, Canada, Madagascar, Korea, with smaller amounts from several other countries. The price of crystalline graphite at the mine varied in 1928 from 1.5 to 5.8 cents per pound depending upon grade, the average being 4.8.[4]

Notwithstanding that production is much less than amount used, the difference being supplied by imports, there is some graphite exported. The exported product is largely finely powdered and prepared for pencils. Much, perhaps most, of the export is Mexican graphite refined in this country. Smaller amounts are exported for other purposes as for use in paints, lubricants, commutator brushes, and dry cells.

A tariff is placed on imported graphite. The tariff is heaviest on crystalline flake and least on amorphous. From 1922, when the tariff was established, the duty on imported crystalline flake has been 1½ cents per pound; on crystalline lump chip or dirt, 20% ad valorem; and on amorphous, 40% ad valorem.[5]

Graphite is found in Texas in the pre-Cambrian formations, the Packsaddle schist of the Central Mineral region, and to a lesser extent in the Carrizo schists of the Van Horn region. Graphite-bearing schists in the Central Mineral region have been observed and more or less prospected in several localities. South of the Southern Pacific Railroad west of Little Llano River and 1⅞ miles south of Lone Grove in Llano County is a locality where graphite schists have been somewhat mined. This belt of graphite schists is found on both sides of the river and can be followed in a northwesterly trend until lost under overlying Cambrian sandstone.[6] Another belt of graphite schists is reported 2 miles south of Llano. This belt also trends in a northwesterly direction.

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[1]U. S. Bureau of Mines, Information Circular 6118, p. 27, April 1929.

[2]Idem, p. 27.

[3]U. S. Bureau of Mines, Mineral Resources of the United States, Part 2, p. 82, 1929. The ton used in statistics on graphite is the short ton of 2,000 pounds.

[4]Ibid., p. 83.

[5]Some revision of tariff rates is proposed in the tariff schedule now under consideration in Congress.

[6]U. S. Geol. Surv. Bull. 450, p. 78, 1911.

Graphite is mined by the Southwestern Consolidated Graphite Company on Clear Creek 9 miles west of Burnet, Burnet County. The graphite is found here as a stratum of graphitic schist from 75 to 150 feet thick and of undetermined downward extent. At either side of the graphite schists are mica schists and both are cut by dikes. The graphite schist stratum trends northeast-southwest and has been located on this property by surface exposure and borings through an extent of 4,500 feet. Two and a half or 3 miles farther to the north a plant was opened in 1928 by the Burnet-Texas Company and temporarily worked in what is apparently the same stratum.

This plant of the Southwestern Consolidated Graphite Company, established in 1916 or 1917, was burned in March 1927. A new modern plant has been built in which the oil-froth flotation method is used for recovery of graphite. The plant is equipped with an electro-static unit which, however, is but little used since the grades of graphite required by the market are obtained by the flotation process.

The schist strata at this locality dip at a high angle approaching vertical, and mining is carried on from the surface exposure downward. The uppermost few feet of the schist at the surface are decomposed and discolored by oxidation. However, the surface as well as the deeper ore is milled, no overburden being removed. Working is by the open pit method from the surface downward. The pits are nearly dry, comparatively little water other than rainfall coming in. The more abundant minerals of the schist are quartz, flake graphite, a limited amount of mica, and in the unoxidized schist, pyrite, and perhaps other sulphides. The ore varies in richness but will probably average 5 or 6 percent graphite.

Graphite is found in many countries. The following brief notes refer to the more important producing regions. Lump crystalline graphite is found in large quantities in Ceylon where it occurs in veins varying from 1 inch to several feet in width. In Madagascar, flake crystalline graphite occurs widely in schists and gneiss. The graphite-bearing strata are 30 to 65 feet in thickness and may be followed at their outcropping margins for long distances. The graphite ore averages 10 to 12 percent, although rich ore may be as much as 50 to 80 percent graphite. The principal associated minerals are quartz and mica. The standard refined product is 85 percent carbon. The reserves in Madagascar are large.[7]

Amorphous graphite is found in large quantities in Mexico, near Hormosillo, Senora, about 350 miles from the Mexican border. The graphite is from coal beds. There are several beds of which the thickest is said to be 9 or 10 feet on an average although, as a result of folding and squeezing, may be as much as 24 feet thick. The strata alternating with the graphite are chiefly sandstones, the whole being near intruded granites. The graphite may contain as much as 95 percent carbon, although an average is 86 percent or thereabouts. A small percentage of silica, alumina, and iron is present.

Austria produces much low-grade amorphous graphite. In the Alps of Styria the graphite is altered coal which occurs in beds up to 30 feet thick and grades into anthracite. The strata alternating with the graphite are slates and limestones. The graphite runs 40 to 95 percent carbon. In lower Austria, amorphous graphite occurs in strata between mica schist and gneiss.

Bohemia produces graphite chiefly amorphous and of low grade. The deposits are graphite schists. In Italy amorphous graphite grading into anthracite occurs in beds up to 10 feet thick. Korea produces considerable graphite, most of which is amorphous and of low grade.

In the United States amorphous graphite is or has been produced in several states. The principal producing states are Nevada and Wisconsin, although amorphous graphite is mined or reported from several other states.

Available literature—United States Bureau of Mines, Information Circulars 6118, 6122, 6123, 6124 published in 1929; Bull. 112, 1920; Mineral Statistics, 1928 and earlier.

Rock Products, vol. 31, no. 18, pp. 74-77, Sept. 1, 1928.

Non-Metallic Minerals, by R. B. Ladoo, pp. 258-280, 1925.

[7]U. S. Bureau of Mines, Information Circular 6122, 1929.