Fluorspar

Fluorspar, this month's featured mineral resource commodity, has been widely used in steelmaking since the introduction of basic open-hearth furnace technology in the late 19th century. Its uses have grown and changed over the last 100 years, and now fluorspar's most important markets are fluorochemicals, aluminum refining and steel. M. Michael Miller, Fluorspar Commodity Specialist for the U.S. Geological Survey, has prepared the following information about fluorspar.

The term fluorspar refers to crude or beneficiated (extracted) material that is mined and/or milled for the mineral fluorite (calcium fluoride). It is the common commercial term used to describe concentrates of fluorite sold as metallurgical grade (97 percent or less calcium fluoride) or acid grade (more than 97 percent calcium fluoride).

Although fluorite has been used for ornamental purposes since ancient times, it was not until the end of the 15th century that Basilius Valentinus, and later Georgius Agricola in 1529, recorded its earliest use as a flux. In this case, a flux is a substance that lowers the melting temperature of a material. Agricola named fluorite for the Latin word "fluere" meaning to flow, and the term was first formally used by mineralogist J.D. Dana in 1868. Fluorite is a nonmetallic mineral, containing 51.1 percent calcium and 48.9 percent fluorine.

No fluorspar production occurred in the United States in 2002, but the United States was a major producer of fluorspar from World War II until the late 1960s. Competition first from Europe, then from Mexico and finally from China forced the cessation of all fluorspar mining in the United States. The Ozark-Mahoning Company in southern Illinois was the last major mining operation and it closed in late 1995.

In 2002, reported U.S. fluorspar consumption was 588,000 metric tons, of which 533,000 tons was acid grade and 55,000 tons was metallurgical grade. Most acid-grade fluorspar goes toward making hydrofluoric acid and aluminum fluoride; these two uses accounted for nearly 90 percent of acid-grade consumption in 2002. The major use for hydrofluoric acid is in the manufacture of various fluorocarbon chemicals that are used as refrigerants, foam-blowing agents, solvents and in the production of high-performance plastics. Most aluminum fluoride is used in aluminum smelting, where it is added to the molten bath of cryolite and fluorspar to lower the operating temperature, and to suppress the creation of sodium, which reduces production efficiency. Metallurgical-grade fluorspar is consumed primarily as a flux for steelmaking, but may also be consumed in cement, enamels, glass and fiberglass, iron and steel castings, and welding rod coatings. U.S. demand for fluorspar is met by imports, sales from the National Defense Stockpile and byproduct calcium fluoride recovered from industrial waste streams. Currently, the United States imports almost all its fluorspar from China, South Africa and Mexico.

World fluorspar production was 4.51 million tons in 2002. China is by far the world's largest fluorspar producer; in 2002, it produced about 2.45 million tons or 54 percent of total world production. China is also the world's largest exporter; it exported 1.0 million tons of fluorspar in 2002. Other significant producing countries, in descending order and share of world production, were Mexico (14 percent), South Africa (5 percent), Mongolia (4 percent) and Russia (4 percent).

Because the largest use of hydrofluoric acid is in the production of fluorocarbon chemicals, the phaseout of the first generation of fluorocarbons (chlorofluorocarbons or CFCs) has had a negative effect on world demand for fluorspar. In 1989, world production of fluorspar reached an all-time high, which coincidentally was the year the Montreal Protocol on Substances that Deplete the Ozone Layer was ratified. By 1994, as a result of the phaseout of CFCs, fluorspar production had decreased by more than 32 percent. As more ozone-friendly fluorocarbon compounds (many of which actually contain more fluorine than the CFCs they are replacing) have been developed, fluorspar production has recovered somewhat but it still remains about 19 percent below the 1989 peak.

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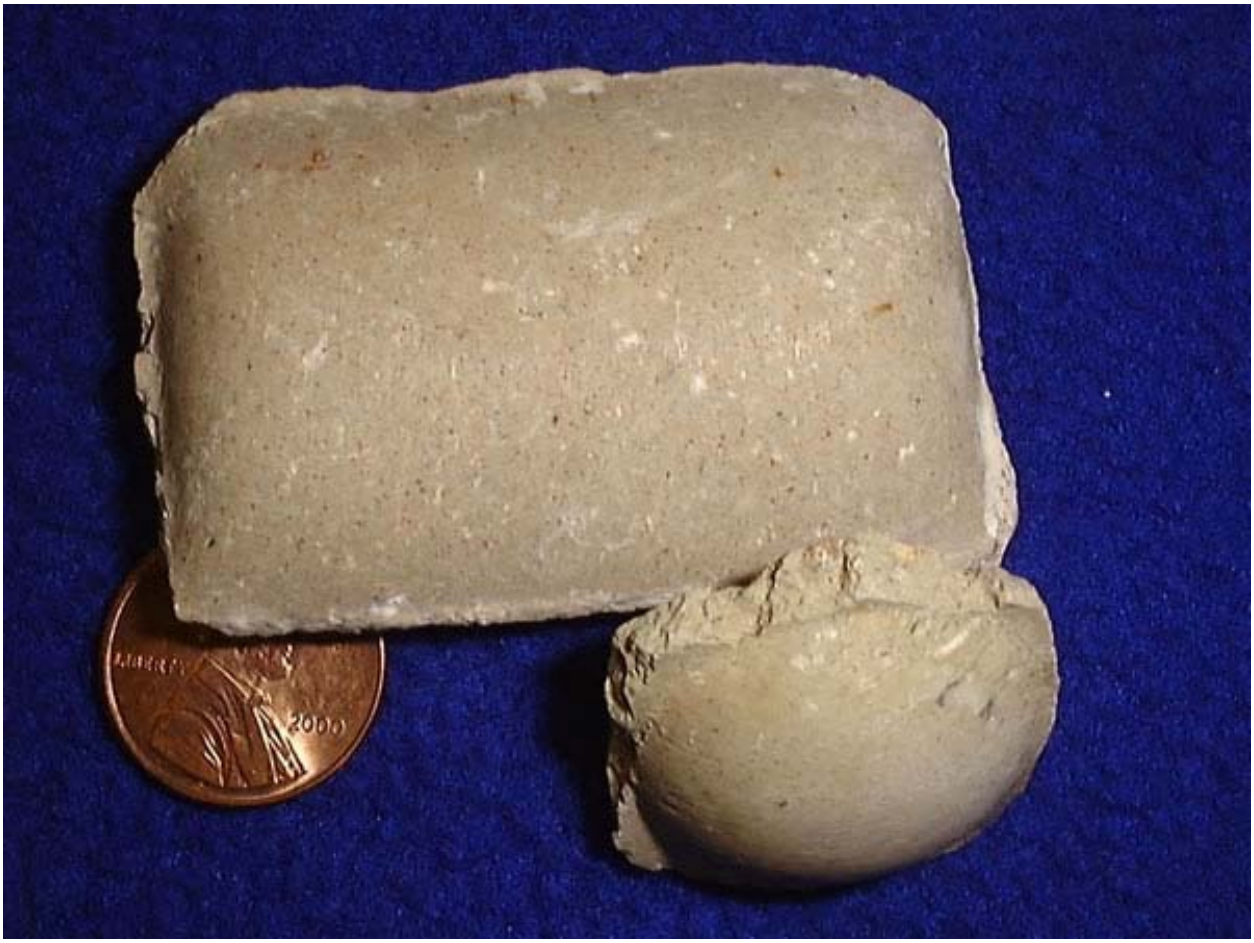

Sample of fluorspar, a common commercial term used to describe concentrates of fluorite (penny for scale). Image from *Minerals in Your World*.