

## Fluorite—Illinois' State Mineral

Deep purple, amethyst, sky blue, sea green, sunny yellow, and crystal clear—the mineral fluorite comes in all colors. Many types of fluorite even glow under ultraviolet light. They're "fluorescent."

Pure fluorite ( $\text{CaF}_2$ ), made of the elements calcium (Ca) and fluorine (F), is colorless. The various colors result from tiny amounts of other elements substituting for the calcium in the crystalline structure.

Transparent to translucent, this glass-like mineral may be found as irregular masses filling veins that cut through rocks, or in flat-lying bands or layers parallel with the bedding planes of sedimentary rocks. As the photos show, fluorite also forms as clusters of beautiful cubic crystals.

Light reflects strongly from fluorite's crystal faces and cleavage surfaces, which can be polished to a high luster. As lovely as a gemstone, fluorite is brittle and relatively soft (4 on Moh's hardness scale), so it's unsuitable for ring settings. Brooches and pendants must be handled carefully to avoid scratching or fracturing the mineral specimens in these settings.

Just for display, miners chipped octahedrons out of coarse crystals of the mineral known to the mining industry as fluorspar. They called the eight-sided crystals "diamonds."



### How did Illinois' fluorite deposits form?

Hot water containing fluorine and other dissolved chemicals rose from deep in the earth during the Jurassic Period, about 150 to 200 million years ago. The water flowed through northeast-trending faults and fractures in limestones laid down earlier in the Mississippian Period, about 350 million years ago.

When the hot brines reached the calcium-rich Mississippian rocks, the temperature and other conditions were just right for crystallizing fluorite along the walls of the faults and in flat-lying layers parallel to the beds of limestone. These host rocks dissolved and were replaced with the fluorite.

### Country's leading producer of fluorspar

Since the early 1800s, fluorite has been mined in southeastern Illinois. The fluorspar-rich region, which reaches from southeastern Illinois into parts of Kentucky, was called the Illinois–Kentucky Fluorspar Mining District.

In Illinois, fluorite was mined almost exclusively in Hardin and Pope Counties. The main production came from fissure-vein deposits in the Rosiclare district, and stratiform (bedding plane) deposits in the Cave in Rock district (map, p. 2). Other areas in the two counties yielded smaller amounts of the mineral.

Most mining was underground, as much as 1,300 feet deep. But open-pit mines operated where fluorite deposits intersected land surface.

Illinois displaced Kentucky as the country's leading producer of fluorite in 1942. For many years, Illinois accounted for more than 50% of total U.S. fluorspar production. But by 1990, more than 90% of the fluorite used in the U.S. was imported. Illinois was the only remaining domestic producer.

Competition from foreign producers coupled with high costs of underground operations made Illinois' fluorspar mining unprofitable. The last fluorspar mine in Illinois closed in December 1995. Fluorspar is no longer mined anywhere in the United States.

**Illinois' State Mineral** The General Assembly made fluorite the State Mineral in 1965, when fluorspar mining was a multimillion-dollar-per-year industry in Illinois. Over the years, much more fluorite has been mined in Illinois than in any other state.

## The many uses for fluorite

Native Americans carved fluorspar to make artifacts, but the first recorded use of Illinois' fluorite was in 1823, when fluorspar mined near Shawneetown in Gallatin County was used to manufacture hydrofluoric acid.

The mineral, fluorite, is vital to the nation's economy. Its uses:

### Mineral

- smelting iron, aluminum, and other metal alloys,
- manufacturing glass, enamel glazes, ceramics, portland cement, and many chemical compounds.

### Hydrofluoric acid

- refining aluminum,
- refining uranium fuel for nuclear reactors,
- making rocket fuel and metal plating.

### Inorganic fluoride chemicals

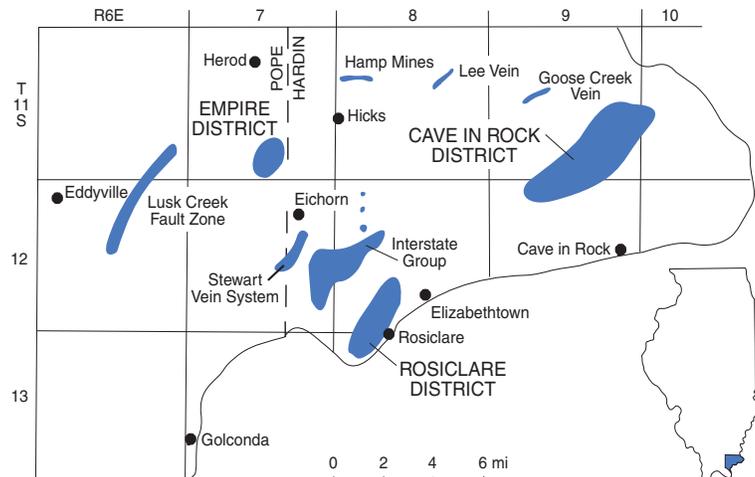
- toothpastes, special fluxes for welding rods, optical lenses, and concrete hardeners.

### Organic fluoride chemicals

- Plastics, refrigerants, nonstick coatings, lubricants, stain repellents, dyes, herbicides, medicines and anesthetics, cleaning solvents, degreasing agents and foaming agents.

One of the most widely used organic fluoride compounds, the refrigerant Freon 12®, is no longer produced in the United States. The chlorine in the compound is thought to damage the protective ozone layer that shields the earth from ultraviolet radiation.

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*Principal mining areas in the southeastern Illinois part of the Illinois-Kentucky Fluorspar Mining District.*

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