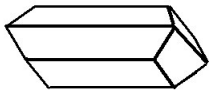
July 1997 Mineral of the Month: Epidote

The dark green, almost black color of our featured mineral causes some to barely give it a second glance. However, not unlike a person who may seem rather plain at first glance, by stopping and examining we come to appreciate the beauty and fascinating properties of this not-so-colorful mineral. We invite you to learn more . . .

PHYSICAL PROPERTIES

Chemistry: $Ca_2(Al,Fe)Al_2O(OH)(SiO_4)(Si_2O_7)$ Calcium-aluminum hydroxyl silicate
Class: Silicates Subclass: Sorosilicates Group: Epidote
Crystal System: Monoclinic
Crystal Habits: Short to long prismatic, often striated; Terminated by a pair of faces forming a blunt wedge; Also tabular, bladed. Much epidote is granular massive
Color: Yellowish green to green, brownish green to greenish black, or black
Luster: Vitreous to slightly greasy
Transparency: Transparent to translucent to nearly opaque
Cleavage: Perfect
Fracture: Uneven to conchoidal; brittle
Hardness: 6-7
Specific Gravity: 3.35-3.45, increasing with iron content
Streak: Colorless
Distinctive Features and Tests: Pistachio color; fuses easily



NAME

Pronounced ep′-i-dōt, the name comes from a Greek word meaning “increase.” The name was given it by the French mineralogist René Just-Haüy (1743-1822) because the base of the vertical prism has one side longer than the other. It is sometimes known as pistacite, from its German name, *pistazit*, meaning “pistachio,” due to its color.

COMPOSITION

Epidote is the name both of a mineral and a mineral group, which group consists of the minerals zoisite, clinozoisite, epidote, piemontite, and allanite. In our write-up, when using the term “epidote” we will be referring to the mineral rather than the group.

No doubt you noticed epidote’s complicated chemical formula above. Perhaps you recognize SiO_4 in the formula and remember it as the silicon-oxygen tetrahedron we learned about last month. In addition, epidote contains an isolated double tetrahedral group as illustrated to the right. It consists of two silicon-oxygen tetrahedrons (the small black dot represents the silicon ion surrounded by four large oxygen ions). These two tetrahedrons then combine by sharing a single oxygen atom in the center. Each double tetrahedron consists of two silicon ions and seven oxygen ions and is written as Si_2O_7, as you may have noticed in the formula.

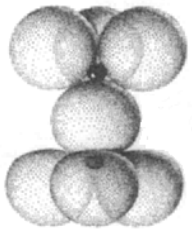


Image Courtesy of Dana’s Manual of Mineralogy

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Epidote Group Members

Mineral Name	Chemical Formula	Differences
Zoisite	$Ca_2Al_3O(OH)(SiO_4)(Si_2O_7)$	More aluminum, no iron

(Zoisite is a polymorph of clinozoisite and belongs to the orthorhombic crystal system.)

The following epidote group members also form a series:

Clinozoisite	$Ca_2Al_3O(OH)(SiO_4)(Si_2O_7)$	More aluminum, no iron
Epidote	$Ca_2(Al,Fe)Al_2O(OH)(SiO_4)(Si_2O_7)$	Less aluminum, has iron
Piemontite (a.k.a. Piedmontite)	$Ca_2(Al,Fe,Mn^3)Al_2O(OH)(SiO_4)(Si_2O_7)$	Contains manganese
Allanite	$(Ca,Ce,La,Na)_2(Al,Fe,Mn,Be,Mg)_3O(OH)(SiO_4)(Si_2O_7)$	An extremely complex silicate, which can contain calcium, cerium, lanthanum, and sodium with aluminum, iron, manganese, beryllium, and magnesium; it will also accept very rare radioactive elements, such as thorium

As in other series, the chemical make-up of a crystal can grade from one member to another. Since our specimens are so dark in color, they may contain more iron than other epidote crystals.

Epidote is a very abundant mineral, not usually in crystals, but as a fine-grained constituent of rocks. When you see something made from marble with a greenish hue, the color is most likely from small grains of epidote in the marble; in fact, there is a good chance that any rock you notice with a pistachio (greenish-yellow) hue is getting its color from small grains of epidote.

COLLECTING LOCALITIES

As mentioned, epidote is an abundant mineral. Well-crystallized specimens are found at Prince of Wales Island in southern Alaska (not far from where our March 1997 almandine garnets in matrix came from), also in Australia and Pakistan, as well as Ala, Italy; Arendal, Norway; and Zermatt, Switzerland. In the United States, epidote crystals are collected in the Elk Creek area, Park County, Colorado; the Seven Devils district in Adams County, Idaho; the Greenhorn Mountains in Kern County, California; and near Riverside, in Riverside County, California, among many others.

The best epidote crystals in the world come from Knappenwand (meaning “miners’ wall”), the name given to a cliff face near Untersulzbachtal, a valley in the Hohe Tauern Mountains in the state of Salzburg, Austria. A large pocket of fabulous epidote crystals was discovered there around 1865 by professional Alpine collectors called *strahlers* who soon sold a number of incredible specimens to museums throughout Europe.

Our exceptional specimens come from Peru, which has been the world’s most prolific source of mineral specimens for the past 17 years. This nation of 23.4 million people of Indian and mixed European and Indian descent sits on the western side of South America. It’s the third largest nation in South America and is almost twice the size of Texas. The nation is split by the Andes Mountains into three major regions: a narrow coastal belt occupied by a barren desert, the jagged snow-covered peaks of the Andes Mountains in the center, and the tropical rain forests of the Amazon Basin to the east. Travelers to Peru

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visit colonial cities that preserve the legacy of the Spanish conquistadors, visit the ancient Inca capital of Cuzco, and explore the lost city of Machu Picchu.

Our specimens come from an area about 90 kilometers (50 miles) due east from the city of Pisco, which you can locate on the map to the right. This mine, called the Mina Provincia Mabel, is in the Huancavelica (pronounced Wãn-kã-vã-lē′-kã) Department, one of 23 that make up Peru, each department being roughly equivalent to an American state. The mine is near the city of Pampa Blanca in the province of Castrovirreyna, a province being the equivalent of a county.

The mining operation at this site is very primitive. Perhaps a local man or woman first noticed some interesting epidote crystals when farming or otherwise working the land. He showed these samples to a dealer who recognized the potential. With perhaps a small crew and some homemade explosives, the earth was moved and the miners attempted to extract specimens by following the vein in the rock while preserving as many specimens as possible. Then the dealer gathered up the specimens and made them available to collectors around the world. The Peruvian dealers and miners are very secretive about their finds, which sometimes makes it difficult to obtain accurate locality information.

JEWELRY & DECORATIVE USES

Epidote is of sufficient hardness to be suitable for cutting into gems and cabochons, spheres and eggs, and other decorative items, but rarely is, due to its dark color. Specimens like those received by Basic Clubmembers are occasionally utilized by jewelry makers who specialize in unusual settings.

Other members of the epidote group, however, are often used and much prized in jewelry. Unakite is a granite made pretty by grains of pink and red feldspar and green epidote. The result is a lovely pink/red/light green stone used in jewelry and tumbled and sold as polished stones. The name comes from *Unaka*, an Indian word given to a range of mountains in North Carolina. Unakite is found in large masses in veins and seams throughout the Appalachian Mountains of the eastern United States.

Zoisite is also used as a gemstone. Pink zoisite is known as thulite and is sometimes cut into cabochons. (The name “thulite” comes from “Thule,” an ancient name for Norway. “Zoisite” comes from Baron von Zois, who supplied samples of the mineral when it was first described in the 19th century.) Rubies were found in green zoisite matrix in Africa, and for many years the ruby was extracted and the zoisite discarded, but recently, cutters and carvers have recognized the beauty of the green zoisite and are making striking cabochons and carvings from it, often with small ruby crystals still visible in it!
In 1967, a prospector named Manuel d’Souza was looking for sapphires in Tanzania, Africa. While there, he discovered exquisite blue zoisite crystals, which were subsequently faceted and given the name Tanzanite by Tiffany and Co. in New York. This beautiful blue/purple gemstone is highly valued because it is pleochroic, that is, it shows different colors when viewed in different directions. One direction is blue, another purple. Most tanzanite gemstones today have been heat treated to enhance the color. There are

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rumors of a green tanzanite having been found in the last couple of years.

ABOUT OUR SPECIMENS

No doubt the seemingly dull black color is the first thing you'll notice when examining your specimen. But look at your specimen under a bright light or with a magnifying glass (or both) and the dark green color jumps out at you. Our clusters, particularly the Deluxe specimens, consist of an aggregate of thin crystals very much like those found at the classic locality in Austria. The term **subparallel** is used to describe the way the crystals radiate outward as they form but keep to the same general direction, until they look rather like a lady's fan or a bushy animal tail.

Most of the crystals, though long, are so thin that the crystal faces are hardly discernible, although some specimens contain a stouter crystal in which the blade shaped termination is very apparent. Along with the epidote, fine crystals of quartz, scheelite, garnet, and calcite are found at the Minas Rosario Mabel, but most of the calcite is dissolved by the miners by means of hydrochloric acid to expose the epidote. Only if the calcite is of an exceptional quality is it allowed to remain. Most of the crystals have been broken by tectonic forces in the area throughout the centuries, and well-terminated epidote specimens are selling at shows for hundreds of dollars.

The two most prestigious American mineral collectors' magazines, the *Mineralogical Record* and *Rocks and Minerals,* have noted the occurrence of this excellent new find in several recent issues:

"Epidote from the fantastic find at the Rosario Mabel mine near Castrovirreyna, Peru, was everywhere at the Munich show this year. Many great single fans of epidote . . . would grace any collector's cabinet."-- Mineralogical Record, volume 28, March-April 1997, page 136

"The typical habit is as long, subparallel sprays of bright, thin crystals . . . Each of the two best of these giants were priced at $15,000, which didn't even seem excessive to me."-- Mineralogical Record, volume 28, May-June 1997, p. 205

"Excellent samples from the Rosario Mabel mine . . . are still plentiful."-- Rocks and Minerals, Volume 72, May/June 1997 p. 171

The new issue of the Mineralogical Record is entirely devoted to mines and minerals of Peru. Because the magazine articles were written before our epidotes locality had been reported, no mention is made of this excellent new find, although the province is highlighted in the magazine. Perhaps now, despite its rather plain color, our new epidote specimens will find themselves as prized members of our collections!

References: Mineralogy, John Sinkankas, Van Nostrand Reinhold Company; Dana's Manual of Mineralogy, 18th Edition, Cornelius S. Hurlbut, John Wiley & Sons, Inc.; 1001 Questions Answered About the Mineral Kingdom, Richard M. Pearl, Dover Publications, Inc.; Minerals and Man, Cornelius S. Hurlbut, Random House; Gemstones, George Frederick Herbert, Pitman Publishing, Getting Acquainted with Minerals, George Letchworth English, McGraw-Hill; Rare and Beautiful Minerals, Fritz Hofmann, Exeter Books; Epidote for Lapidaries, Cynthia Cooke, Lapidary Journal, January 1970; The Epidote Group, Parts I-III, Frederick H. Pough, Ph.D., Lapidary Journal, October-December 1991; Mines and Minerals of Peru, Jack A. Crowley, Roc Currier, and Terry Szenics, Mineralogical Record, July-August 1997; www.ccjewelers.com/tanzanit.html; www.gemstone.org/tanzanite.html; www.lonelyplanet.com; Encarta Encyclopedia, Microsoft and Funk & Wagnalls; Special thanks to Robert Trimingham

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