Xenotime: Characteristics, Origin and Applications

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Learn more about the mineral called xenotime - its characteristics, history, and uses and applications. Xenotime belongs to the family of phosphate minerals that contain rare earth metals. It has a chemical formula of YPO4 (yttrium orthophosphate). Xenotime contains high levels of yttrium, as well as other rare earth metals such as ytterbium and erbium which replace yttrium in the mineralâ€™s main chemical composition.

Characteristics

Typically brown, brownish yellow, or gray, xenotime is a mineral known for its streaks of pale brown, yellowish brown, reddish brown, and white. It has a Mohs hardness scale of 4.5 which means itâ€™s a relatively soft and brittle mineral. Mineralogists describe it as having a vitreous to resinous luster. Xenotime crystals also range in appearance from translucent to opaque. Xenotime contains high levels of yttrium which make up its major composition: yttrium orthophosphate. Other specimens of xenotime have other rare earth metals in the place of yttrium. These alternate metals include dysprosium, erbium, terbium, and ytterbium. Other metal elements also appear as secondary components of xenotime. These are mainly thorium and uranium. Impurities such as trace amounts of uranium and thorium lead to xenotimeâ€™s being radioactive, although xenotime alone is neither radioactive nor luminescent. Xenotime also occurs as a minor accessory mineral found in specimens of igneous rocks such as pegmatites, and gneisses that also contain high levels of quartz and mica.

Origin and History

It was in 1832 in Vest-Agder, Norway that xenotime was first discovered and described. Its name derives from the Greek word for â€œvainâ€•, while the suffix â€œâ€“timeâ€• comes from the Greek word f this suffix is believed to be added due to the mineralâ€™s yttrium content which discoverers first thought to be a newly discovered element. After its discovery in Norway, several sources of xenotime were found in Brazil in South America (where five different mines yielded, and continue to yield, large deposits of the mineral); Madagascar in Africa; and Colorado, North Carolina, Georgia, and California in the United States.

Uses and Applications

There are two major uses for xenotime. Due to its high yttrium content, it is tapped as a major source of such. Yttrium, in turn, is used for creating yttrium-aluminum garnet lasers and yttrium iron garnet microwave filters. It is also a chief source of heavy lanthanide metals such as dysprosium which is used in lasers and creation of rare earth magnets; erbium, a rare earth metal used in lasers as well as in the creation of vanadium steel; gadolinium, another rare earth metal which appears as a major component in various technological applications such as high refractive glass, rare earth magnets, and lasers, and as an MRI contrasting agent and an NMR relaxation agent; and ytterbium, a primary component in the manufacture of infrared lasers as well as an ingredient in chemical reducing agents. Xenotime is also tapped as a gemstone. Fine crystals of xenotime are carefully cut to create brownish yellow gemstones. However, xenotimeâ€™s relative softness (4.5 in the Mohs scale of hardness) make it a challenging crystal to work with.

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