Eveslogite-the latest astrophylite term paper

Sociology, Community

Abstract

Eveslogite, ((Ca, K, Na, Sr, Ba)48[(Ti, Nb, Fe, Mn)12(OH)12Si48O144](F, OH, Cl)14), is a mineral found on Mt. Eveslogchorr in khibiny Massif, Kola peninsula, Russia. It derives its name from this locality, in particular from Mt. Evesglochorr. This mineral occurs as an anchimonomineral veinlet that cross-cuts poikilitic nephiline synite (Hawthorne 2012). This mineral appears to resemble Yuksporite since it forms similar placated fine-fibrous of approximately 0. 05 to 0. 005mm that aggregates outwardly. The color of Eveslogite is yellow or rather light brown. In addition it is a semitransparent mineral that has a white streak and a vitreous luster. Its crystal formation is monoclinic and possess a hardness (Mohs) of 5. This newly discovered mineral belongs to the Astrophylites group of minerals and therefore contains structures that are composed of Titanosilicate layers (Krivovichev et al, 2004). Limited information about this mineral exists due to the few research studies carried out since its recent discovery. Information regarding its effect on heat and the effect of this mineral to the health of an individual has not been explained effectively, thus, ample opportunity for further investigation and research still exists.

Introduction

Eveslogite is a monoclinic-prismatic mineral that contains a trilogy of elements which includes: aluminum, calcium, barium, chlorine hydrogen, fluorine, manganese, iron, niobium, potassium, rubium, oxygen, silicon tantalum, sodium titanium and zirconium. It is usually found at Mount Eveslogchorr, Kola Peninsula, Khibina alkaline massif, in Russia. This mineral

adds to the rapidly expanding class of the porous materials that are vital in gas separation, catalysis, optoelectronics, and in ion exchange processes. According to the article Crystal Research and Technology by Depmeier that seeks to further explain the properties of Eveslogite, this mineral is in almost all aspect similar to Yuksporite, in fact this article explains that it is almost impossible to distinguish these two minerals by looking at their appearance. However, when compared to Yuksporite, Eveslogite is much poorer in Ba content and it possess different thermal capability. This mineral was Yuri Men’shikov in the year 1998. Below is a photo showing the some of the physical features of Eveslogite such as color.

Fig 1. Retrieved from Rocks & Minerals (2012)

Composition

Eveslogite is a complex Titanosilicate made up of numerous elements of silicon, sodium, calcium and potassium. With the chemical formula ((Ca, K, Na, Sr, Ba)48[(Ti, Nb, Fe, Mn)12(OH)12Si48O144](F, OH, Cl)14), Number of atoms in the chemical formula being 298. 4. The listed elements in the formula are; Ba, Cl, Ca, Fe, F, H, K, Mn, O, Sr, Si and Ti. The table below shows the composition of elements and their relative weight that makes up Eveslogite.

In addition, this mineral has the empirical formula Ca22. 46K12. 27Na10. 3Sr1. 8Ba1. 25Ti5. 53Nb3. 34Mn3+0. 95Fe2+0. 83Fe3+0. 2Zr0. 19Rb0. 14Ta0. 08 (OH)12Si47. 3Al0. 41O138. 08(OH)9. 42Cl0. 8 and a molecular weight of 6, 800. 28 grams. Due to this form of composition, Eveslogite’s structure has been observed to resist characterization because of its poor diffraction of its crystals and also due to its small dimensions (Chukanov et

al, 2008). The aspect of characterization has been made possible after the late 20th century discovery of the 3rd generation X-ray synchrotron sources that made it possible to structurally characterize various mineral elements that could not have been characterized using the in-house X-ray sources (Burzo, 2006).

Physical Properties

Eveslogite is a Titanosilicate mineral that falls under the group of Astrophylites and perfectly fits within the point and space group P2/m {P1 1 2/m} {P2/m} {P1 2/m 1}. It is a mineral that is light-brown or yellowish in color. It has a Silky structure with white streak. Its tenacity is brittle and an indistinctly perfect cleavage of {001} and {010}. In regard to its general appearance, as explained by Chukanov et al 2008, this mineral is indistinguishable from Yuksporite and other related Titanosilicate. In addition, the article American Mineralogist further expounds on the both the measured and calculated densities of this mineral. After measuring the density of Eveslogite it recorded a total of 2. 85 g/cm3 but when directly calculated, it recorded a slightly higher density of 2. 93 g/cm3. Additionally, the physical characteristics of Eveslogite includes a fracture that is largely splintery and a rough semitransparent gold like appearance.

A Table showing a summary of the physical characteristics of Eveslogite

Structure

The structure of Eveslogite is based upon complex rods that consists of the corner sharing octahedral (TiO) and the tetrahedral SiO4. Due to its 5-Apatite hardness and density of 2. 85 the general structure of this mineral is

a rigid but porous in nature just like other Astrophylites. Some of the minerals that are largely associated with Eveslogite in terms of close similarity of their structure includes nephiline, biotite, flouritite, K-feldspar, eudialyte and also many other minerals that falls under the Astrophylites group. Eveslogite is an orthorhombic mineral that fits within the space group 2lm prismatic. The complex rods that makes up the structure of Eveslogite are parallel and have an elliptical cross-section appearance when viewed through the 3rd generation X-ray synchrotron sources. Eveslogite structure of the Titanosilicate rods is remarkably unique when compared with other tetrahedra silicates. This is because it consist of a total of nine distinct symmetry independent silicates which includes; SilO4, Si4O4, and Si5O4 similar to the xonolite double chains structure.

Although Eveslogite has a rigid structure, the nanorods {(Ti, Nb)4 (O, OH)4[Si6O17]2[Si2O7]3 are porous. These internal pores in the structure of Eveslogite are defined by eight-Membered rings (8MR) separated by two parallel channels of Si9O4 and Si4O7 tetrahedra groups (Krivovichev et al, 2004). On the other hand, the inside part of eveslogite’s Titanosilicate nanorods is composed of alkali metals cations Na2, Nal, K1-K5 and also the H2O molecules. In general, the structural composition of Eveslogite especially in the discovery of the existence of Titanosilicate nanorods in the composition of this mineral provides a vital notion for further research and understanding of the structural diversity of Titanosilicate and other alkaline Astrophylites. However, at present, the individual crystal structures of the Eveslogite minerals has been described in detail (Chukanov et al 2008).

Geological Occurrence

The particles of Eveslogite are found on Mt. Eveslogchorr in khibiny Massif, Kola peninsula, Russia. In particular the geological occurrence of this mineral and the place of conservation for this mineral is Fersman mineralogical Museum in Moscow Russia (Hawthorne 2012). Eveslogite derives its name from this locality, particularly from Mt. Evesglochorr. Since it is a newly discovered mineral, there have not been extensive research to show if it occurs in any significant amounts in other parts of the world.

Eveslogite often occurs in close proximity with other rare-earth minerals, particularly the other Astrophylites mineral elements, in addition, intergrowths with particular orientations are frequently found. In regard to its geological setting, Eveslogite is a monominerallic veinlet that is known to cut the poikillitic nepheline syenite (Burzo, 2006). Eveslogite is commonly found in peralkaline granitoids, where it may be selectively included by certain major minerals (such as feldspar) or may form aggregates comprised of multiple types of other minerals that are also found in the Russian mountain of Eveslogchorr.

Special Characteristics

Eveslogite synonym is IMA2001-023 and its axial ratios are; a: b: c = 0. 5641: 1: 1. 7768. Among its special characteristics is that its estimated radioactivity is barely detectable. The radioactivity test in regard to Eveslogite can be measured using GRapi= 172. 67 (Gamma Ray American Petroleum Institute Units). According to the research carried out by Krivovichev et al, the chemical composition of eveslogite was determined through a wavelength-dispersion spectrometry which encompasses the

Cameca MS-46 microbe electron which was operating at 20kV. This strategy was adopted because the traditional test of bond lengths and the bond-valence analysis was resulting into errors and therefore could not result into reliable information. Through the use of the wave-length dispersion spectrometry approach, other special feature of the eveslogite were that, the rods in the structure of the eveslogite are separated by walls that appears to be parallel and acts as the main linkage of the rods to the 3-dimensional structure of this mineral. This is a special feature to this mineral since other minerals that falls into this Astrophylites group do not possess these walls in between their rods structure.

Literature Search/Prospects for Further Research

Arguably, the most cited works with regard to the research on Eveslogite is the article by Yuri p. Men’shikov and Ferraris titled Eveslogite, the researcher who collected a specimen of 6x3x1. 5 cm mineral in 1998 which later turned out to be a discovery of a new mineral; Eveslogite. Eveslogite is one of the least researched mineral in all the Astrophylites group. Therefore, this mineral lacks a lot of supporting evidence with regard to its applicability and health effects of Eveslogite. Since the basic structure and chemistry of Eveslogite is seemingly less and poorly understood, reliable methods are of paramount importance in performing experiments and additional research aimed at describing the composition of all Eveslogite and the ways that it can be used in the industry just like the other Astrophylites.

Predominantly, more research is required so as to explain the effects of this mineral to the general health of individuals. There is no previous research studies that seeks to explain how this mineral would affect persons health

wise when in contact with it or during the use of it in various industrial processes such as in gas separation, catalysis, optoelectronics, and in ion exchange processes. Nonetheless, the sole explanation for lack of enough or substantial literature for this mineral is because it is considered a 21st mineral since it became approved by the mining authorities in Russia. Therefore, I believe that more studies will be carried out to seek in detail Eveslogite.

Conclusion

In conclusion, titanium phyllosilicate minerals such as Eveslogite and Yuksporite have in the recent past attracted a lot of attention because of their interesting modular crystal chemistry (Krivovichev et al, 2004). Men’shikov played a vital role in the chemical explanation of Eveslogite, he suggested that Eveslogite should be placed in the Astrophylites group of minerals and also further expounded on the Titanosilicate heteropolyhedral layers in its structure. However, it is evident that more research is required so as to further explain both the importance and disadvantages of Eveslogite as a mineral resource, especially in regard to its economic use.

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