SKELETONIZED APOPHYLLITE FROM CRESTMORE AND RIVERSIDE, CALIFORNIA

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Skeletonized apophyllite is hydrous silica after apophyllite, which retains some of the physical and optical properties of the parent mineral, as well as its crystal form, and thus differs from merely pseudomorphic opal. Similar skeletonization has been demonstrated for other silicate minerals and also has been produced in the laboratory.

Recent blasting at Crestmore Commercial Quarry, the well known mineral locality three miles north of Riverside, California, has revealed snow-white tetragonal crystals up to 5 mm. long, associated with veins of colorless prehnite cutting garnet-diopside rock. Diligent search yielded only approximately 10 grams of the material with less than one gram of well-formed crystals.

A few of the crystals were found to have sufficiently smooth faces to give reflections which, though multiple and hazy, were good enough to measure on a one circle goniometer. The average of 12 measurements of (111) to $(11\bar{1})$ gave 119° 50′ as contrasted with 121° 04′ for apophyllite as given in *Dana's System*. A closer value of 119° 33′ was obtained by Luedecke (1) on apophyllite from Radauthal. The crystals have the habit of the apophyllite from Crestmore described by Eakle (2) with dominant pyramid {111}, generally subordinate prism {100} and very small, or absent, base {001}. No other forms were found on the Crestmore material.

The New City Quarry in the Victoria district of Riverside has yielded apophyllite crystals of cubo-octahedral habit up to 3 cm. in size. No prehnite was found with these crystals but late coatings of honey-colored calcite with dog-tooth habit are common. The crystals show bands or layers of pink, rather fibrous apophyllite alternating with much softer snow-white skeletonized apophyllite. One of the larger crystals contained a 1 cm. pseudocubic isotropic core of resin opal.

While the crystal forms are those of apophyllite and the basal cleavage is perfect, other physical properties of skeletonized apophyllite are markedly different. The hardness is about 1 and the mineral is extremely brittle. The color is dead snow-white, the luster is pearly on the basal pinacoid but dull on all other surfaces, and the crystals are not transparent.

Optical examination showed the skeletonized apophyllite to have variable properties. Thin sections indicated the maximum birefringence to be approximately .006, while minimum alpha obtained from crushed fragments was 1.439 and maximum gamma was 1.449. A uniaxial negative interference figure was given by many of the small plates.

Professor W. J. Crook of the Mining Department at Stanford University kindly made a spectroscopic study of the nearly pure mineral and reports: "The mineral appears to consist largely of silica and magnesia with small amounts of iron and manganese. Aluminum, copper, silver, titanium, and nickel are present in exceedingly small quantities."

An analysis for silica by the fusion method gave 88.54% and a Penfield test for water yielded 7.21%, indicating that the skeletonized apophyllite is hydrous silica (95.75%) with about 4% of magnesia, etc. A microchemical test for fluorine, following the method of Dr. L. W. Staples (3), gave negative results.

The chemical composition is similar to opal and as Eakle (2) has noted that the opal which coats apophyllite and okenite at Crestmore shows strong luminescence under the electric spark, the skeletonized apophyllite was examined under the iron arc. The associated coatings of hyalite opal glowed bright yellow and some skeletonized crystals showed almost as vivid a color, while other crystals failed to glow at all. The varied behavior of the crystals is probably due to the fact that in some cases microscopic films of secondary halite occur between basal plates of the skeletonized apophyllite.

The retention of some of the optical and physical properties of the parent mineral by the Crestmore and New City Quarry skeletonized apophyllite, suggests that the original apophyllite has undergone a selective leaching process in which calcium, fluorine, and potassium have been removed without destroying the silica framework of the crystals. However, a preliminary *x*-ray examination, using the powder method, failed to give any definite lines.

A search of the literature reveals that hydrous silica pseudomorphs after apophyllite have been found elsewhere. Schaller (4) reported quartz pseudomorphs after apophyllite from Fort Point, California, which were snow-white and opaque but did not yield optical properties. Chemical analysis showed them to contain 90.58% silica, 4.32% water, with the remaining 5% magnesia, lime, and alumina. The water content indicates that this may be skeletonized apophyllite rather than quartz. A. Scheit (5) found isotropic opal with index of 1.447 as pseudomorphs after apophyllite in the Böhmischen Mittelgebirge.

The skeletonization of other minerals has been reported previously. Rinne (6) described bauerite as the hydrous silica end-product formed by the baueritization of biotite, and retaining the optical properties of the original biotite. The term "baueritization" might be extended to apply to all cases where a silicate has been changed to silica with the partial retention of optical and physical properties. However, as the term has been used so often to mean the bleaching of biotite mica, it would seem wiser not to enlarge on the original definition.

The conversion of a silicate to a silica skeleton is readily brought about on some minerals in the laboratory by treating them with dilute acid. Smulikowski (7) has treated glauconite with acid which changes the mineral to a hydrated silica which is still optically negative and biaxial. On treating various zeolites with dilute HCl, Rinne (8) found that heulandite, brewsterite, and scolecite were converted to silica, but retained crystallographic angles and optical properties similar to those of the unaltered minerals. Chabazite and phillipsite, however, were converted to a silica gel. Apophyllite also is converted to a silica gel when treated with HCl according to *Dana's Textbook of Mineralogy.*

References

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