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CAVANSITE AND PENTAGONITE FROM LAKE OWYHEE STATE PARK, MALHEUR COUNTY, OREGON

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Cavansite, a calcium and vanadium silicate of formula $Ca(VO)(Si_4O_{10}).4H_2O$, occurs as sky-blue to greenish-blue radiating prismatic rosettes up to 5mm in size associated with its dimorph, pentagonite, in a roadcut near Lake Owyhee State Park in Malheur County, Oregon. Discovery of these two minerals is attributed to Mr. and Mrs. Leslie Perrigo of Fruitland, Idaho, (at this locality in 1961), and to Dr. John Cowles at the Goble locality in 1963 (see below).

Associated with the cavansite and pentagonite are abundant colorless analcime, stilbite, chabazite, thomsonite and heulandite, as well as colorless to pale yellow calcite, and rare green or colorless apophyllite. This occurence and a similar emplacement (of cavansite only) near Goble, Columbia County, Oregon (co-type localities), represent the only known deposits of these two minerals in the United States.

As determined by X-ray fluorescense and crystal structure analysis, cavansite is orthorhombic, conforms to space group Pcmn (D_{2h}^{16}), has a unit cell with a=10.298(4), b=13.999(7), c=9.601(2) Angstroms, contains four formula units, is optically biaxial positive and strongly pleochroic. Pentagonite, the dimorph, occurs as prismatic crystals twinned to form fivelings with a star-shaped cross section. Also orthorhombic, it belongs to space group $Ccm2_1(C_{2v}^{12})$, and has a unit cell with a=10.298(4), b=13.999(7), and c=8.891(2) Angstroms, and also contains four formula units. The pentagonite crystals are optically very similar to cavansite, but are biaxially negative. The cell dimensions given tend to vary to a small degree, presumably because of varying zeolitic water content. Both cavansite and pentagonite have silicate layer structures in which the layers are held together by VO^{2+} groups and Ca^{2+} ions, but they differ in the way the SiO_4 tetrahedra link to form the layers (Staples, Evans and Lindsay, 1973).

The host rock, which has been named the Owyhee Basalt, is typically fine-grained, dark grey to black, ranges from very dense to highly vesicular, and includes palagonite tuff deposits which often make up a significant percentage of the total groundmass (Corcoran, 1965).

Minor localized faulting in the roadcut itself has permitted a secondary mineralization in the interstitial spaces, which are typically less than 2cm at the greatest width. In the hand specimens examined, it appears that the associated minerals were deposited contemporaneously with the cavansite and pentagonite. Many specimens occur with a portion of the cavansite completely covered by heulandite or analcime, while within a centimeter or two one can find beautiful cavansite "berries" perched upon calcite and the zeolites.

The deposit occurs in the south bank of the roadcut just northeast of the day-use area of the park. It is the last roadcut before one "dips down" into the day-use area. The deposit had not been heavily worked since road work in the late 1950's, and so a considerable amount of weathered surface material had to

be removed before good material was exposed. The host rock is spongy in nature and is difficult to break cleanly. In most cases it tends to peel away like onionskin, and most specimens show much matrix and little cavansite. From an aesthetic perspective, the "best" cavansite specimens are the "blueberries": compact, tightly-packed rosettes up to a centimeter in diameter. Less tightly-packed specimens occur more frequently, and are generally a paler blue upon casual inspection. In many cases, the cavansite is partially to completely covered with a druse of heulandite, analcime or calcite, which gives the specimen a pale but sparkly appearance.

Since the known mineralized area lies wholly within the confines of the Lake Owyhee State Park, collecting to date has been prohibited in accordance with State law. However, the author and a small group of amateur collectors from the Mount Hood Rock Club, including three junior club members, were recently permitted to conduct limited collecting at the location. Members of the collecting group included Mike Sunde, Bonnie, Alex and Karen Huang, Matt Harris and the author. The collecting locality itself is within the right-of-way of the Malheur County road which provides access to the State park and points south. Both the State and the County, in turn, lease their land from the Bureau of Relcamation. So, in order to obtain permission to collect at the area, it was necessary to secure approval from all three of the involved agencies. The author contacted the Bureau of Reclamation in Boise, which in turn coordinated the approval process with the State and the County. The result was a series of three collecting expeditions which together yielded well over a thousand small specimens of cavansite and five specimens of pentagonite. The author, as well as the entire collecting group, gratefully acknowledges the efforts of the following individuals who, together, made the trip possible: Mr. Jerrold D. Gregg, Project Superintendent, Mr. James Brooks, Director of Lands, and Mr. Curtis Carney, Facility Manager, all from the Bureau of Reclamation, Central Snake Projects Office; Mr. Dan Rau, Park Ranger, Lake Owyhee State Park; and Mr. Mark Ferns, District Geologist, State of Oregon Department of Geology and Mineral Industries (DOGAMI), Baker Field Office, and Mr. Jerry Gray, DOGAMI, Portland Office.

The collecting group intends to provide representative specimens of cavansite free of charge to academic institutions who may wish to add this species to their permanent collections. These institutions should address inquiries to the author. Small specimens of cavansite are available free of charge to interested collectors who inquire in person at Lake Owyhee State Park, but no mail inquireies will be honored. In addition, collectors may obtain a small specimen of cavansite by sending a check for $5.00, to cover preparation, packing and shipping costs, to the author at the above address.

REFERENCES

Corcoran, R. E., Geology Of Lake Owyhee State Park And Vicinity, Malheur County, Oregon, The Ore Bin, Volume 27 Number 5, pp 81-98, May 1965.

Staples, Lloyd W., Evans Jr., Howard T., and Lindsay, James R., Cavansite And Pentagonite, New Dimorphous Calcium Vanadium Silicate Minerals From Oregon, American Mineralogist, Volume 58, pp. 405-411, 1973.