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ART. VI.—*Erionite, a new Zeolite;* by ARTHUR S. EAKLE.

THE mineral described in the present paper occurs in a rhyolite-tuff from Durkee, Oregon, and was discovered and presented to the museum for identification by Mr. E. Porter Emerson. The tuff consists of a dull gray, amorphous groundmass containing numerous patches of light brown, pitchstone-like material, fresh sanidine and plagioclase crystals, with an occasional dark silicate altered to chlorite. Large masses of opal fill the cavities. This opal is mostly of the milky and hyalitic kinds, yet often grades into a beautiful precious variety, showing a rich play of colors and forming excellent gem material.

The zeolite occurs as very fine threads, having a snow-white color and pearly luster. These threads resemble fine woolly hairs, having the same curly nature and soft feel. They occur, sometimes as white tufts firmly adhering to a solid base of milky opal, resembling a filamentous growth of the opal, and sometimes as compactly matted fibers filling the rock fissures. In some of the specimens, the filaments are encrusted with a thin shell of white opal, indicating that the opal was subsequently formed from the zeolite.

The mineral fuses easily and quietly in the Bunsen flame, to a clear colorless glass. Heated in a closed tube, the fibers darken slightly, emit a burnt odor, and give off much water which reacts strongly alkaline. The tuff also shows this alkaline reaction, so it is evident that organic matter of some sort is present in the rock. The organic substance in the zeolite must be a part of its constitution and not a contamination of any hydroscopic water, since it cannot be eliminated by long boiling in water or acids.

The weight of the fibers fluctuates materially from the influence of the air, making correct weighings difficult. The loss over sulphuric acid is water of crystallization, as evidenced by the rapidity with which such loss is regained on exposure. Two-thirds of a gram of the material which had been exposed to the air of the laboratory for two months, was weighed in a platinum crucible and placed in a desiccator for a week. At the end of this period the loss was 6·95 per cent; in one hour, on the balance pan, one-half of this loss was regained; in two and a half hours, the fibers reached their original weight; in four hours, their weight became stationary and exceeded the original weight by 60 milligrams, although the weighings were made in a warm dry room and the balance case contained a beaker of strong sulphuric acid. In the air bath at 110° C., the loss was 7·68 per cent; at 200° C. it amounted to 13·32 per cent; at 280° C. it was 15·25 per cent, of which last all but 2 per cent was regained over night, when placed under a beaker in the laboratory. The loss was practically constant for the different temperatures, as shown by repeated trials and different durations of heating. All water of crystallization was apparently expelled at 280° C., for on further heating up to 400° C. no more loss was experienced. The remaining water was expelled at low red heat, without fusion, the total loss averaging 17·30 per cent. This makes a difference of about 2 per cent as probably constitutional water. Alkaline water was still given off at 200° C., but at 280° C. all evidence of ammonia had disappeared. The water of crystallization evidently contains the organic substance, and considering the ease with which the fibers absorb moisture, it is readily conceivable that such moisture may have carried a certain amount of organic impurity into the mineral. The amount of ammonia was determined by combustion with soda-lime, collecting the gas in standardized H_2SO_4 and titrating with KOH solution, the result being 0·22 per cent. While this amount is too small to affect the general formula of the silicate, even if considered an essential constituent, it is nevertheless sufficient to form an important pyrognostic characteristic. The fibers are soluble with extreme difficulty in HCl. Complete decomposition was effected by boiling them in concentrated acid, evaporating the solution to dryness, grinding the residue and again boiling, the silica in the end separating as a fine sand, with no gelatinization. In the analyses, decomposition was effected (1) by fusing the fibers with the mixed carbonates, (2) by first igniting to a glass and then fusing with the carbonates, and (3) by dissolving in HCl. These various analyses were sufficient to establish the molecular ratio of the mineral, although from the nature of the material, closely agreeing duplicates were difficult to obtain. An average of the analyses gave

			Ratio.	Calculated for $6SiO_2 . Al_2O_3(Ca_1K_2Na_2)O+6H_2O$
SiO_2	57·16	= ·953	6·03	56·52
Al_2O_3 ...	16·08	= ·158	1·	16·01
CaO	3·50	= ·062	1	4·40
MgO	0·66	= ·017		
K_2O	3·51	= ·039		3·69
Na_2O ...	2·47	= ·040		2·43
H_2O	17·30	= ·960	6·07	16·95
Total..	100·68			100·00

Here the ratio $Si:Al_2 = 6:1$, $Si:H_2 = 1:1$, $R:Al_2 = 1:1$, while $Ca+Mg:K_2:Na_2=2:1:1$. This gives a general formula $6SiO_2, Al_2O_3(CaK_2Na_2)O+6H_2O$, or allowing one molecule of water as hydroxyl, $H_2Si_6Al_2CaK_2Na_2O_{17}+5H_2O$. The general formula is analogous to that of stilbite, in which the calcium has been largely replaced by the alkalies, but in other respects the zeolite has no resemblance to stilbite and is undoubtedly a distinct mineral. The specific gravity is 1·997, determined by the methylene iodide and Thoulet solutions. Unfortunately the filaments are so delicate that complete optical determinations cannot be made. The mineral has a moderately strong double refraction. The acute bisectrix lies parallel to the fibers, since an axial figure normal to the obtuse bisectrix can be seen in the fibers. The axis of least elasticity is apparently in the direction of the fibers, making the mineral positive in character. Extinction is exactly parallel and indicates an orthorhombic crystallization. Several attempts were made to get a cross section of a bunch of the fibers, by imbedding them in various media, but nothing in the way of an axial figure was obtained. No difference was observed in the polarization colors between the fibers heated to 280° C. and those not heated.

The name *erionite*, from ἔριον, wool, is proposed for the zeolite, on account of its woolly appearance.

An analysis of the milky opal associated with the mineral gave SiO_2 95·56, H_2O 4·14 per cent and a trace of alumina.

Mineralogical Laboratory, Harvard University, April, 1898.