THE AMERICAN MINERALOGIST, VOL. 44, SEPTEMBER-OCTOBER, 1959

OCCURRENCE OF WAIRAKITE IN METAMORPHIC ROCKS OF THE PACIFIC NORTHWEST*

WILLIAM S. WISE
Dept. of Geology, Johns Hopkins Univ., Baltimore 18, Md.

During a preliminary study of low grade metamorphic tuffs and tuff breccias, wairakite ($CaAl_2Si_4O_{12} \cdot 2H_2O$), the calcium analogue of analcite, was found in a number of specimens from the Keechelus (?) formation in the Mr. Rainier National Park, Washington. This is believed to be the first reported occurrence of wairakite in metamorphic rocks. Steiner (1955) first described the occurrence and optical and physical properties of wairakite from (the active hydrothermal area of) Wairakei, New Zealand. Coombs (1955) presented *x*-ray data.

Wairakite, as well as several other very fine grained zeolites, occurs in the low grade metamorphic tuffs of the Keechelus (?) formation. Identifications are based primarily on *x*-ray diffraction patterns. About 2 gms. of a rock are crushed to pass 120 mesh, and then centrifuged in bromoform diluted with acetone to a density of about 2.40 gms./ml. All zeolites float and a yield of 0.1 gms. is not uncommon. Minor impurities in the separations are quartz and chlorite.

To safely distinguish wairakite from analcite, the (400) peak ($2\theta_{CuK\alpha}$ = approx. 26.2°) must be scanned at a speed of $\frac{1}{4}$°/min. This reflection, as well as others, will show double peaks (Coombs, 1955). Table I presents *d*-spacings of a Keechelus wairakite and the New Zealand wairakite. In six observed wairakites from different localities the *d*-spacing of the peaks referred to as (400) show only slight variations.

In the tuffs wairakite occurs in cavity fillings, in replaced plagioclase crystals, and in the groundmass. Figures 1 (plane light) and 2 (crossed nicols) illustrate the replacement of a plagioclase crystal by a fine meshwork of wairakite. The grain size of individual wairakite crystals is very small (commonly less than 0.02 mm.). Typical of coarser material is a crossed lamellar twinning (see Steiner, 1955, p. 692, Fig. 2). Similar twinning was found frequently in the wairakite from Mt. Rainier. For example, most of the wairakite in Fig. 2, if viewed under high power, will show such twinning.

Due to the very fine grained nature, most physical and optical properties could not be determined. Refractive indices were found to be:

$$\alpha = 1.500 \quad \pm 0.001$$
$$\gamma = 1.501 \quad \pm 0.001$$
$$\gamma - \alpha = 0.001 \text{ to } 0.0005$$

* This work was supported in part by a grant from the National Science Foundation.

TABLE I. *X*-RAY DATA FOR WAIRAKITE FROM THE KEECHELUS FORMATION, COMPARED TO THAT FROM NEW ZEALAND (COOMBS, 1955). CuKα RADIATION WITH A SCANNING SPEED OF ½°/MINUTE

Keechelus wairakite		New Zealand wairakite	
d Å	I	*d* Å	I
6.850	35	6.85	4
5.577	77	5.57	8
4.840	35	4.84	4
3.654	23	3.64	3
3.412*	100	3.42	8
3.390*	92	3.39	10
3.21	14B	3.21	1B
3.05	6B	3.04–3.06	1B
2.918*	52	2.909	5
2.900*	37	2.897	3
2.79	5	2.783	1
2.770	6	2.770	1
2.681	17	2.680	4
2.675	9	2.67	1
2.506	11	2.50	1
2.491	15	2.489	4
2.416	10	2.418	3
		2.35	1B
		2.26–2.28	1B
2.214	9	2.215	4
		2.17	1
		2.147	1
		2.115	1
		2.095	1
1.996	2	1.996	2
		1.93	1B
1.89	9B	1.886–1.895	3B
		1.867	1
1.857	8	1.857	3
		1.844	1
		1.822	1B
1.701	14	1.722–1.732	4B
		(continues)	

*—determined from scanning speed of ¼°/min. with quartz as an internal standard.
I—arbitrary intensity scale.
B—broad peak (or line).

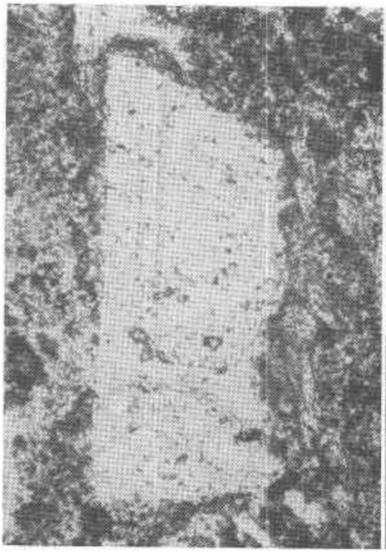

FIG. 1. (Left) Wairakite (with some small grains of epidote and chlorite) replacing a plagioclase crystal in a tuff breccia consisting of rock fragments and a fine-grained groundmass. The groundmass is composed mostly of chlorite, wairakite, unaltered plagioclase, leucoxene, and celadonite. Plane light, ×130.

FIG. 2. (Right) Same as Fig. 1 under crossed nicols. The wairakite is nearly black, while the unaltered plagioclase remains light. ×130.

Wairakite in the groundmass of an average tuff looks very similar to glass or analcite, except for a faint birefringence, occasional crossed twinning, and a lack of cleavage planes.

I am indebted to Dr. Hans P. Eugster for helpful criticism and discussions.

REFERENCES

COOMBS, D. S. (1955), *X*-ray observations on wairakite and non-cubic analcime: *Min. Mag.*, **30.** 699–708.

STEINER, A. (1955), Wairakite, the calcium analogue of analcime, a new zeolite mineral: *Min. Mag.*, **30.** 691–698.