The crystals are prismatic with perfect 010 and 110 cleavages. The optic plane is 010 (Winchel, 1951).

The zeolite mineral in the sandstone core sample from the Standard Oil Company of California Well C.C.M.O. 4, No. 35, San Joaquin Valley, was isolated from the rock by hand picking under a stereoscopic microscope.

Optical properties of the mineral are as follows: crystals are prismatic with two good cleavages; $(-)2V=$ moderate; $\alpha=1.508\pm.002$, $\gamma=1.516\pm.002$; $\gamma-\alpha=.008$; Ext. to $c=40°-45°$.

*X*-ray diffraction data were obtained with a G. E. powder camera of 7.1744 cm. radius. The powder sample, mounted with Duco cement on a rotating glass filament, was exposed to Cu $K_\alpha$ radiations for 6 hours. Intensities of the lines were estimated visually.

These *x*-ray data agree closely with the data reported by Coombs (1952) for laumontite and leonhardite.

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# UNIT CELL DIMENSIONS OF URANINITE

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It appears that, in general, samples of pitchblende from hydrothermal veins have a smaller cell size than uraninites from pegmatites (Table 1). The values of $a_0$ of uraninites from different sources reported in the literature (1) support this observation.

The relatively small cell size of pitchblende is due to the following factors: (*a*) Relatively high oxidation, due to the fine-grain or fine fibrous permeable nature of the material and the resulting large surface area. The oxidation involves the conversion of $U^{IV}$ to $U^{VI}$ with valence compensation effected by the entrance of oxygen into the vacant 8-fold position of the fluorite-type structure; the $U^{VI}$ ion being relatively smaller than the $U^{IV}$ ion, greater oxidation tends to decrease the unit cell size. (*b*) Relative freedom from larger thorium and rare earth ions, ($U^{IV}=1.05$ Å; $Th^{IV}=1.10$ Å; $Ce^{IV}=1.02$ Å) (2), which are ordinarily present in relatively large amounts in uraninite from pegmatite. Pitchblende and relatively highly oxidized uraninite in general give diffuse and faint diffraction effects. This is due both to line broadening from small particle size, and also, as Brooker and Nuffield (1*b*) have pointed out, to variation

TABLE 1. UNIT CELL DIMENSIONS OF SOME UNTREATED SAMPLES OF URANINITE

| *Locality* | *Description* | *Film Character* | *Analysis Reference** | $a_0$ *in Angstroms* |
|---|---|---|---|---|
| Himmelfahrt Mine, Freiberg, Saxony | Pitchblende<br>Vein | Poor pattern | | 5.39 ±0.01 |
| Shinarump I*b* Mine, Seven Mile Canyon, near Moab, Utah | Pseudomorph after wood<br>Hydrothermal | Faint broad lines | | 5.406±0.003 |
| Happy Jack Mine, White Canyon, Utah | Black friable mass<br>Hydrothermal | Sharp lines | | 5.411±0.003 |
| Near Schmeideberg, Silesia, Germany | Pitchblende<br>Vein | Broad lines | 4 | 5.413±0.002 |
| Monument #2 Mine, Apache County, Arizona | Sandstone<br>Hydrothermal | Broad lines | | 5.415±0.003 |
| Ranwick claims, Theano Point area, Algoma district, Ontario | Pitchblende<br>Vein | Poor pattern | | 5.42 ±0.02 |
| Joachimsthal, Bohemia | Pitchblende<br>Vein | Broad lines | 4 | 5.430±0.001 |
| Marienberg, Saxony | Pitchblende<br>Vein | Broad lines | | 5.435±0.001 |
| Palermo, North Groton, New Hampshire | Hard black crystal<br>Pegmatite | Broad lines | | 5.439±0.006 |
| Mansfeld, Germany | Vein in "kupferschiefer"<br>Hydrothermal | Broad diffuse lines | | 5.440±0.004 |
| Newry, Maine | Altered crystal<br>Pegmatite | Broad lines | | 5.447±0.001 |
| Ruggles Mine, Center Grafton, New Hampshire | Hard black crystal<br>Pegmatite | Broad lines | 5 | 5.447±0.004 |
| Beryl Mountain, near Acworth, New Hampshire | Hard black crystal<br>Pegmatite | Broad lines | | 5.457±0.004 |
| Beryl Mountain, near Acworth, New Hampshire | Hard black crystal<br>Pegmatite | Broad lines | | 5.465±0.001 |
| Pied des Monts, Saguenay District, Quebec | Hard black crystal<br>Pegmatite | Sharp lines | 6 | 5.480±0.003 |
| Strickland Quarry, Portland, Connecticut | Glossy black crystal<br>Pegmatite | Sharp clear lines | 7 | 5.484±0.003 |
| Wilberforce, Ontario | Hard black crystal<br>Pegmatite | Sharp clear lines | 8 | 5.487±0.001 |
| Karelia, U.S.S.R. | Glossy black crystal<br>Pegmatite | Sharp clear pattern | 9 | 5.489±0.002 |
| Gordonia, South Africa | Hard black crystal<br>Pegmatite | Broad lines | 10 | 5.490±0.001 |

* The analysis referred to was made on the *x*-rayed material in the case of the Gordonia and Wilberforce samples, and on samples from the same locality in all other cases.

in degree of oxidation within the sample, with accompanying variation in cell size.

The cell size also should vary with the amount of radiogenic lead present ($Pb^{IV}=0.84$ Å; $U^{IV}=1.05$ Å) (2). As Wasserstein (1*d*) has pointed out this offers a means of age determination by measurement of cell size. For the ideal application of this method, allowance must be made for the effect on $a_0$ of secondary oxidation, the presence of thorium and other elements in solid solution, and radiation damage.

All of the present samples were run on the Philips *x*-ray diffractometer and paper recorder. An internal standard of $ThO_2$ was employed. The Mansfeld and Palermo specimens also were photographed on film in 114 mm. cameras. None of the samples had been heated or otherwise treated. The $ThO_2$ value was 5.59543 Å ± 0.00005 Å, earlier obtained from a precision back-reflection camera. The value of $a_0$ for the synthetic $UO_2$ (Synthetic "C. P. Brown $UO_2$" prepared by the Shattuck Company, Denver), thus obtained was 5.468 Å ± 0.002 Å. The best value available for this substance is 5.4682 Å at 20° C. (3).

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## REMOVAL OF MINERAL GRAINS FROM THIN SECTIONS*

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A simple method by which individual mineral grains may be removed from a thin section and isolated for study by oil immersion, *x*-ray, or microchemical techniques has been used by the writer with considerable success. The basic concept of removing material from a thin section is

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