VI.—*Note on Uranocircite.*

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WHEN investigating the constitution of autunite* or lime-uranite, I secured an extremely fine specimen (of what was then supposed to be this mineral) from the mine at Falkenstein in the Saxon Voigtland. I was puzzled by the low percentage of water and other anomalous results which my analysis of the specimen in question gave. While at work upon the solution of this difficulty, Weisbach's note upon uranocircite or baryta-uranite appeared.† Winkler's analysis of the Falkenstein mineral clearly proves that we have in it a pure baryta-uranite—a new species of the uran-mica group. I did not, however, abandon my own researches into the nature of this mineral, for the mode in which the water was held by this mineral remained unknown. If isomorphous with autunite, it might be expected to contain 10 aq. in the molecule, 2 of which would probably be retained at 100° C. The following new analyses of uranocircite dispose of this hypothesis, proving that this species contains but 8 aq., 6 aq. being abandoned by the finely-powdered mineral either *in vacuo* over sulphuric-acid, or at 100° C, while the remaining 2 aq. require a strong heat for their elimination.

The central parts of large freshly-broken crystals of uranocircite from Falkenstein were crushed, picked over under a lens, and then finely powdered. These were the analytical results:—

I. ·411 gram *in vacuo* over H_2SO_4 lost—
·037 ,, H_2O, and gave
·097 ,, $BaSO_4$.

II. ·177 ,, lost on ignition
·027 ,, H_2O.

III. ·527‡ ,, *in vacuo* over H_2SO_4 lost
·038 ,, H_2O; at 100° C. it further lost
·013 ,, H_2O; and on ignition, a final loss of
·022 ,, H_2O.

* J. Chem. Soc., N.S., xiii, p. 109. † Jahr. Min., 1877, p. 407.
‡ After deduction of ·004 gram, insoluble matter.

.123 gram Ba SO_4 was obtained in the same analysis. Now the formula Ba O, 2 U O_3, P_2O_5 8 H_2O, demands these percentages:—

		WINKLER OBTAINED
BaO	15·08	14·57
2 UO_3	56·74	56·86
P_2O_5	13·99	15·06
8 H_2O	14·19	13·99

Of BaO my two analyses given above showed 15·58 and 15·32 per cent. respectively, while the total percentages of water which I found likewise closely accorded with those demanded by theory and with those obtained by the German analyst. But in my third and most complete analysis, I obtained results showing that the several molecules of water in uranocircite are not retained with equal tenacity. In the following table the conditions to which the powdered mineral was exposed, together with the percentage losses of water which it suffered corresponding to certain calculated percentages, are given:—

CONDITIONS.	EXPERIMENTAL LOSS.	THEORETICAL LOSS.
In vacuo over H_2SO_4 temp. 9° C to 16°	7·21	4 aq.=7·09
In air bath at 100° C	2·47	2 aq.=3 55
At a red heat	4·17	2 aq.=3·55
Sum	13·85	*8 aq.=14·19

Some further experiments have led me to conclude that at a temperature of about 20° C this mineral will lose 6 aq. by the removal of the atmospheric pressure and moisture. It then afterwards suffers no appreciable loss at 100°, while it retains at that temperature, just as autunite and torbernite do, the remaining 2 molecules of H_2O. Thus uranocircite resembles autunite in the ease with which its hold on the greater part of its water of crystallization is relaxed when atmospheric pressure and moisture are withdrawn; while its 8 molecules (not 10) of water bring it near torbernite. It will be instructive to compare these three phosphates from our present point of view.

*10 aq. correspond to 17·13 per cent.

	AUTUNITE	URANOCIRCITE.	TORBERNITE.
In natural condition	$\begin{matrix}CaO\\2\,UO_3\end{matrix}\Big\}P_2O_5$, 10 aq.	$\begin{matrix}BaO\\2\,UO_3\end{matrix}\Big\}P_2O_5$, 8 aq.	$\begin{matrix}CuO\\2\,UO_3\end{matrix}\Big\}P_2O_5$ 8 aq.
Dried *in vacuo*	$\begin{matrix}CaO\\2\,UO_3\end{matrix}\Big\}P_2O_5$, 2 aq.	$\begin{matrix}BaO\\2\,UO_3\end{matrix}\Big\}P_2O_5$. 2 aq.	$\begin{matrix}CuO\\2\,UO_3\end{matrix}\Big\}P_2O_5$ 8 aq.
Dried at 100°	$\begin{matrix}CaO\\2\,UO_3\end{matrix}\Big\}P_2O_5$, 2 aq.	$\begin{matrix}BaO\\2\,UO_3\end{matrix}\Big\}P_2O_5$, 2 aq.	$\begin{matrix}CuO\\2\,UO_3\end{matrix}\Big\}P_2O_5$ 2 aq.

I may mention, in conclusion, that Winkler's analysis of uranospinite, the rare calc-uran-arseniate from Schneeberg, does not conclusively prove it to contain 8 molecules only of water. The experimental numbers decidedly favour a formula with 10 aq.

	THEORY.	
	$\begin{matrix}CaO\\2\,UO_3\end{matrix}\Big\}As_2O_5$, 8 aq.	$\begin{matrix}CaO\\2\,UO_3\end{matrix}\Big\}As_2O_5$, 10 aq.
		EXPERIMENT.
Percentage of water	14·31	17·27 .. 16·29.