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THE ELECTROLYTIC METHOD APPLIED TO URANIUM.

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THE purpose of the present communication is to call attention to the conditions under which uranium can be quantitatively determined in the electrolytic way in solutions of the acetate, the sulphate, and the nitrate, and also to record several separations of uranium by the same means from other metals. It is not necessary to comment further upon the form in which the uranium is precipitated or upon the way in which the deposit is subsequently treated in order to weigh it, as those points have received sufficient attention elsewhere.[1]

ELECTROLYSIS OF URANIUM ACETATE.

	U_3O_8 present in grams.	29 per cent. acetic acid. cc.	Dilution. cc.	Current.		Voltage.	Temperature. °C.	Time. Hours.	U_3O_8 found in grams.	Error in grams.
1	0.0986	0.2	125	$N.D._{.107} = 0.29$	A	16.25	70	5	0.0988	+0.0002
2	0.0986	0.2	125	$N.D._{.107} = 0.3$	A	12.2	70	5	0.0989	+0.0003
3	0.1972	0.2	125	$N.D._{.107} = 0.55$	A	13.5	70	4	0.1968	−0.0004
4	0.1972	0.2	125	$N.D._{.107} = 0.3$	A	10.75	70	6	0.1970	−0.0002
5	0.1972	0.2	125	$N.D._{.107} = 0.135$	A	5.5	70	5	0.0966	−0.0006
6	0.2952	0.2	125	$N.D._{.107} = 0.16$	A	4.5	75	5	0.2946	−0.0006
7	0.2952	0.1	125	$N.D._{.107} = 0.1$	A	4.5	70	7	0.2948	−0.0004
8	0.2298	0.1	125	$N.D._{.107} = 0.09$	A	4.25	70	6	0.2297	−0.0001
9	0.2298	0.2	125	$N.D._{.107} = 0.07$	A	4.25	70	$5\frac{1}{2}$	0.2299	+0.0001
10	0.2298	0.1	125	$N.D._{.107} = 0.05$	A	4.0	65	5	0.2299	+0.0001

It was hoped that possibly iron might be separated from uranium in the acetate solution. Direct experiment demonstrated the opposite. The basic iron salt invariably separated when the temperature of the solution rose to 50° C. Further, the presence of iron in the solution apparently retarded the precipitation of the uranium, as none of the hydroxide of the latter separated with a current of 0.18 ampere and 8 volts. On adding chrome alum to the uranium acetate solution containing 2 cc. of free acetic acid and increasing the voltage to 20, there occurred no

[1] *Am. Chem. J.*, 1, 329; This Journal, **20**, 279; and Smith's "Electrochemical Analysis," p. 94.

deposition of uranic hydroxide; the chromic oxide on the other hand was converted into chromic acid.

THE ELECTROLYSIS OF URANYL NITRATE SOLUTIONS.

Ur_3O_8 present in grams.	Dilution. cc.	Temperature. °C.	Current.	Voltage.	Time. Hours.	Ur_3O_8 found in grams.
0.1222	125	75	$N.D._{107} = 0.035$ A	4.6	$5\frac{1}{2}$	0.1225
0.1222	125	65	$N.D._{107} = 0.04$ A	2.25	$7\frac{3}{4}$	0.1218

Quantitative results were also obtained by the electrolysis of the sulphate. The neutral salt solution was diluted to 125 cc. and heated to 75° C., when a current of from 0.02 to 0.04 ampere for 107 sq. cm. of cathode surface and 2.25 volts was passed.

ELECTROLYSIS OF URANYL SULPHATE.

Ur_3O_8 present in grams.	Dilution. cc.	Temperature. °C.	Current.	Voltage.	Time. Hours.	Ur_3O_8 found in grams.	Error in grams.
0.1320	125	75	$N.D._{107} = 0.02$ A	2	$6\frac{1}{4}$	0.1320	....
0.1320	125	75	$N.D._{107} = 0.02$ A	2	$5\frac{1}{2}$	0.1322	— 0.0002
0.1393	125	75	$N.D._{107} = 0.04$ A	2.25	5	0.1395	— 0.0002
0.1393	125	70	$N.D._{107} = 0.038$ A	2.25	7	0.1392	— 0.0001

THE SEPARATION OF URANIUM FROM BARIUM, CALCIUM, MAGNESIUM, AND ZINC.

In the paper by Smith[1] to which reference has already been made, he calls attention to the separation of uranium in the electrolytic way from the alkali metals and from barium. Actual results are given. It seemed desirable to amplify the suggestion; hence the presentation of the results given below. It may be said here, that in attempting to separate nickel and cobalt no satisfaction could be obtained, so that eventually that particular line of experiment was abandoned. During the precipitation of the urano-uranic hydrate the dish should be well covered so that as little evaporation as possible occurs. It was observed that in case of evaporation there was danger of other salts separating upon the exposed metal and on refilling with water the uranium precipitate was apt to enclose the same and thus carry with it a slight impurity. This precaution is especially necessary in the separation from zinc.

[1] *Loc. cit.*

SEPARATION OF URANIUM FROM BARIUM (ACETATES).

	U_3O_8 present in grams.	Barium present in grams.	29 per cent. free acetic acid. cc.	Dilution. cc.	Temperature. °C.	Current.	Voltage.	Time. Hours.	U_3O_8 found in grams.	Error in grams.
1	0.1116	0.11	0.5	125	70	$N.D._{.107} = 0.02$ A	2	$5\frac{1}{2}$	0.1119	+0.0003
2	0.1116	0.11	0.5	125	65	$N.D._{.107} = 0.04$ A	8	$5\frac{1}{2}$	0.1117	+0.0001
3	0.1116	0.11	0.2	125	70	$N.D._{.107} = 0.1$ A	4.5	4	0.1117	+0.0001

SEPARATION OF URANIUM FROM CALCIUM (ACETATES).

	U_3O_8 present in grams.	Calcium present in grams.	29 per cent. free acetic acid. cc.	Dilution. cc.	Temperature. °C.	Current.	Voltage.	Time. Hours.	U_3O_8 found in grams.	Error in grams.
1	0.1116	0.1	0.2	125	70	$N.D._{.107} = 0.025$ A	2.25	$6\frac{1}{2}$	0.1113	−0.0003
2	0.1116	0.1	0.2	125	70	$N.D._{.107} = 0.04$ A	2.5	$5\frac{1}{2}$	0.1114	−0.0002
3	0.1116	0.1	0.2	125	70	$N.D._{.107} = 0.05$ A	2.25	$4\frac{1}{4}$	0.1113	−0.0003
4	0.1116	0.1	0.2	125	70	$N.D._{.107} = 0.025$ A	2.0	$4\frac{3}{4}$	0.1115	−0.0001

SEPARATION OF URANIUM FROM MAGNESIUM (ACETATES).

	U_3O_8 present in grams.	Magnesium present in grams.	29 per cent. free acetic acid. cc.	Dilution. cc.	Temperature. °C.	Current.	Voltage.	Time. Hours.	U_3O_8 found in grams.	Error in grams.
1	0.1116	0.1	0.1	125	70	$N.D._{.107} = 0.026$ A	2.25	6	0.1115	−0.0001
2	0.1102	0.1	0.1	125	70	$N.D._{.107} = 0.05$ A	2.25	$5\frac{1}{4}$	0.1104	+0.0002
3	0.1120	0.1	0.1	125	75	$N.D._{.107} = 0.15$ A	4.0	4	0.1119	−0.0001

SEPARATION OF URANIUM FROM ZINC (ACETATES).

	U_3O_8 present in grams.	Zinc present in grams.	29 per cent. free acetic acid. cc.	Dilution. cc.	Temperature. °C.	Current.	Voltage.	Time. Hours.	U_3O_8 found in grams.	Error in grams.
1	0.1120	0.1	0.1	125	70	$N.D._{.107} = 0.021$ A	2.25	6	0.1120	....
2	0.1102	0.2	0.2	125	70	$N.D._{.107} = 0.017$ A	2.25	6	0.1099	−0.0003
3	0.1102	0.1	0.1	125	70	$N.D._{.107} = 0.02$ A	2.2	6	0.1100	−0.0002
4	0.1102	0.1	0.2	125	75	$N.D._{.107} = 0.025$ A	4.4	$4\frac{1}{2}$	0.1103	+0.0001
5	0.1102	0.15	0.2	125	75	$N.D._{.107} = 0.01$ A	2.2	6	0.1105	+0.0003
6	0.1102	0.2	0.2	125	75	$N.D._{.107} = 0.02$ A	2.25	6	0.1099	−0.0003

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