DEPARTMENT OF MINES.

South Australia.

-RESEARCH AND DEVELOPMENT BRANCH-

SOUTH ALLIGATOR URANIUM N.L.

FIRST REPORT.

TREATMENT OF PITCHBLENDE GRAVITY CONCENTRATE.

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INDUSTRIAL CONFIDENTIAL.

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1. SUMMARY.

Laboratory tests on two samples of pitchblende gravity concentrates received from South Alligator Uranium N.L. and assaying 50 percent U_3O_8, show that the material can be further upgraded to 70 percent U_3O_8 by removal of iron pyrite by flotation; the latter constituting about 30 percent by weight of the gravity concentrate.

Grinding prior to flotation is not necessary and batch treatment in a unit flotation cell would be practicable. Recoveries of over 90 percent of both the uranium and the pyrite would be expected in practice by this method.

2. INTRODUCTION.

A request was made by South Alligator Uranium N.L. to carry out laboratory tests on samples of pitchblende concentrates and middlings produced in the El Sharana gravity plant. Correspondence from the company mentioned grades of 38 percent and 19 percent U_3O_8, respectively, for the concentrates and middlings. The two test samples as received represented the concentrate fraction and assayed 50 percent U_3O_8. The material was reported to require cleaning from contaminants such as pyrite and hematite. No middling sample was received.

3. MATERIAL EXAMINED.

Two samples of gravity concentrate were examined, one of approximately 10 pounds weight assaying 51.2 percent U_3O_8 which was received by hand from a representative of the company.

A later sample of about 50 pounds weight was received and this sample assayed 50.5 percent U_3O_8.

4. EXPERIMENTAL PROCEDURE and RESULTS.

The laboratory treatment for the two samples was similar.

4.1 Magnetic Separation.

A portion of the material was tested in a Stearns laboratory magnetic separator. Only a very small amount of magnetics was removed and it was therefore considered of no value as a method of concentration.

4.2 Flotation of Pyrite.

Most of the pyrite appeared to be present in sizes finer than 20 mesh. A portion weighing 500 grams riffled from the 10 pound sample was screened on this mesh size and the minus 20 mesh fraction conditioned in a laboratory Fagergren flotation cell for 3 minutes with 0.5 lb of potassium amyl xanthate per ton and a further one minute with 0.2 lb of eucalyptus oil per ton. A rougher pyrite concentrate was floated. The plus 20 mesh fraction from preliminary screening was then combined with the tailing from the pyrite float. The results are shown in Table 1.

TABLE 1.

Flotation of Pyrite from Screened Feed (10 lb. sample).

Product.	Weight Percent.	U_3O_8 Percent.	U_3O_8 Distrib. Percent.
Pyrite concentrate.	30.0	6.8	4.0
Final tailing.	70.0	70.0	96.0
HEADS.	100.0	51.0	100.0

4.3 Examination of 50 lb. sample.

A screen analysis was carried out on the second sample and the screen fractions were assayed for uranium and sulphur to determine the distribution of these constituents. Results of the screen analysis are shown in Table 2.

TABLE 2.

Screen Analysis and Distribution of Sulphur and Uranium in Sample.

Tyler Mesh.	Weight Percent.	U_3O_8 (Radiometric) Percent.	Sulphur Percent.	Distribution U_3O_8 Percent.	Distribution Sulphur Percent.
+ 10.	0.9	6.9	0.82	0.14	0.06
- 10+ 14	1.6	76.4	1.86	2.56	0.24
- 14+ 20	7.7	73.2	1.56	11.80	0.95
- 20+ 28	9.7	73.4	3.55	14.90	2.70
- 28+ 35	10.0	68.0	4.85	14.30	3.75
- 35+ 48	10.5	59.8	6.90	13.20	5.65
- 48+ 65	6.6	36.8	9.20	5.15	4.80
- 65+100	14.0	31.8	18.30	9.30	19.75
-100+150	15.0	29.8	20.50	9.35	23.45
-150+200	9.4	33.4	25.80	6.60	18.85
-200	14.6	41.6	17.30	12.70	19.80
HEADS.	100.0	47.7	12.9	100.0	100.0

A further flotation test, to remove pyrite was carried out on the second sample under conditions similar to those used on the ten pound sample. Results of this test are shown in Table 3.

TABLE 3.

Flotation of Pyrite from Screened Feed (50 lb. Sample).

Product.	Weight Percent.	U_3O_8 Percent.	Sulphur Percent.	Distribution U_3O_8 Percent.	Distribution Sulphur Percent.
Pyrite conc.	28.0	3.8	46.0	2.0	98.6
Final tail.	72.0	70.6	0.25	98.0	1.4
HEADS.	100.0	51.9	13.1	100.0	100.0

5. SPECTROGRAPHIC ANALYSIS of FINAL PITCHBLENDE CONCENTRATES.

A sample of the concentrate was analysed spectrographically and also assayed for chlorine and sulphate, these latter being the two main contaminants which incur penalties under the buying contracts.

Results were:-

Spectrographic.

Classification.	Approx. Concentration.	Metal.
Major.	(10-100%).	U
Minor.	(1-10%)	Cu, Pb, Fe, Si, Al.
Heavy Trace.	(0.1 -1%)	Mn, Ca, Mn, V, Mg. Zn.
Trace.	(0.01-0.1%)	Cr, B.
Faint Trace.	(10-100 ppm)	Bi, Co, Cd, As.

Chemical.

Chlorine.	0.04%
SO_3.	0.15%

6. CONDITIONS and RECOMMENDATIONS.

A study of the screen analysis and distribution of uranium in Table 2 shows that by screening the material on 35 mesh, a concentrate representing 30 percent of the original material by weight can be obtained at a grade of 69.5 percent U_3O_8 and a recovery of 44 percent of the uranium.

The minus 35 mesh fraction of the feed can be treated in a unit flotation cell of the desired capacity. A weighed amount 50 lb for example, could be fed into the flotation unit with sufficient water to give a pulp density of 20 to 30 percent solids, conditioned with reagents for 5 minutes, and the pyrite floated. The tailing from this operation could be dewatered and combined with the plus 35 mesh product. A cell of capacity equivalent to the Denver No.7 laboratory unit cell would have ample capacity for the amount of feed to be treated.

A suspended type of screening mechanism fitted with an 18" screen would be suitable.