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The Effect of Ferric Iron on Uranium Adsorption Efficiency & Quality of Product using Ion Exchange Resin IRA 400.

by.

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Experiments on ion exchange adsorbtion of uranium from sulphuric acid leach liquors of Radium Hill ores, have demonstrated that ferric iron in the liquor has a detrimental effect on adsorbtion efficiency and on the quality of the product.

The columns used were 2" internal diameter and 6' long and they were operated on a multi column series basis. Each of four columns ~~were~~ was charged with 1500 ml wet settled resin giving a bed depth of 3 feet.

The resin used was Amberlite IRA 400 and the feed liquor was metered into the columns at 200 ml per minute equivalent to athree minute retention time. Break through in the second column was assumed when the effluent assayed approximately 2% of the feed in U_3O_8 content.

Typical results obtained are presented in Table 1.

Table 1. Adsorbtion of Uranium on Amberlite IRA 400.
Effect of Ferric Iron in the Feed.

	Feed Characteristics						Elution Loadings on Leading Column U_3O_8 g/l WSR.	% Fe in Ignited product.
	Composition g/l				pH	Redox EMF		
No:	U_3O_8	Fe total	TiO_2	SO_4				
5	1.83	12.8	4.6	68.9	1.8	-320	76.8	1.3
6	2.36	9.5	0.3	55.9	1.75	-340	70.4	1.7
7*	2.36	9.5	0.3	57.8	1.75	-371	58.2	6.9
6A	1.82	15.2	2.5	64.5	1.85	-378	35.3	18.6
6A! Redcd	1.82		2.5		1.85	-341	54.0	9.2

* No 6 liquor was oxidized to No 7 by the addition of 230 ml of 100 volume ydrogen peroxide and 90 ml of 18N sulphuric acid to 40 litres of liquor.

! Liquor 6A was reduced by passing the liquor through a bed of 3" iron nails in a 2000 ml cylinder at a flow rate of 200 ml per minute. 1 ml of 36N sulphuric acid was added per litre to restore the pH from 2.1 to 1.85 after reduction. The U_3O_8 in this reduced liquor was assumed equal to that in 6A. The total Fe and SO_4 would be greater.

When the values for feed No 7 are compared to those for No 6 and those for No 6A reduced compared to 6A, the results show that the oxidized liquors in each case give poorer loadings and products. This demonstrates that ferric iron competes with uranium and seriously affects U_3O_8 resin loadings and the quality of the final product.

Some caution is necessary in interpreting the liquor characteristics from its redox potential since this figure is dependent not only on the ferric iron content but also on the total iron, whereas resin loadings and quality of product probably depend only in the former.
For example, compare No 5 and 6. Each gives a high quality product and a satisfactory loading although their redox values are 20 mv apart.

The explanation appears to be that although $\frac{Fe^{+++}}{Fe^{++}}$ is higher in 6 than in 5, the total iron in 6 is so much lower that the total ferric iron is probably little different from that in 5.

A similar explanation is advanced for the fact that the reduced 6A does not behave as satisfactorily as 6 although their redox ~~and~~ EMF'S are alike. A ferric iron analysis is therefore considered a more reliable guide.

A more systematic study of this effect is being investigated.

Part of this work was carried out in collaboration with Dr G. Lower of Atomic Energy Division, American Cynamid Co.

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