

GM 14526

TESTING SAMPLES OF XANTHATES IN COMPARISON WITH SIMILAR FLOTATION REAGENTS USED IN INDUSTRY (INVESTIGATION NO 2238)

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Énergie et Ressources
naturelles

Québec 

DEPARTMENT OF MINES AND RESOURCES

BUREAU OF MINES

CANADA

Report

Ottawa, June 3, 1947.

R E P O R T

of the

MINERAL DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2238.

Testing Samples of Xanthates Submitted by the
Dominion Rubber Company Limited, Montreal, in Comparison
with Similar Flotation Reagents Used in Industry.

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Ministère des Richesses Naturelles, Québec

SERVICE DES GITES MINÉRAUX

No GM- 14526

Note:

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(Copy No. 5.)

O T T A W A

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Shipment:

On April 3, 1947, two samples of xanthates were received, for testing, from the Dominion Rubber Company Limited, 550 Papineau Avenue, Montreal, Quebec. The samples were designated as sodium ethyl xanthate No. 60-P119 and potassium ethyl xanthate No. 60-P117.

Purpose of the Investigation:

The purpose of the investigation was to test these xanthates against those currently used in the laboratory and in industry--in this case Bear Brand reagents--to see whether they exhibited similar collecting properties on the common sulphide minerals.

Chemical Analyses of Samples:

The following chemical analyses of the xanthates were submitted with the samples:

	Sodium Ethyl Xanthate No. 60-P119	Potassium Ethyl Xanthate No. 60-P117
	- Per Cent -	
Xanthate	93.4	97.1
Thiosulphate	0.84	0.45
Carbonates	1.34	1.34
Sulphites	0.49	0.94
Caustic alkali	0.48	0.26
Moisture and Volatile	1.06	Nil.
Sulphides	Nil.	Nil.
Thiocarbonates	Nil.	Nil.

Investigative Procedure:

The three most common sulphide minerals floated with xanthates without the use of activating reagents are those associated with copper (chalcopyrite), lead (galena) and iron (pyrite) ores. In this investigation three typical ores were selected which were known to be amenable to flotation concentration of copper, lead and iron.

Employing standard methods of flotation testing, each of the xanthates submitted by the Dominion Rubber Company was tested in comparison with the Bear Brand xanthates under identical conditions* with each ore.

(Note:)
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("Identical conditions" in this case refers to)
(the grinding, conditioning periods, quantities of)
(reagents added, flotation time, and other factors,)
(each of which was maintained as uniform as possi-)
(ble in comparative tests. It will be observed)
(that the calculated feed assay for each test)
(varied slightly.)

Test No. 1(A-D). - Copper Ore.

The tests on the Copper Ore were made as shown in Table I.

(Continued on next page)

(Investigative Procedure, cont'd) -

TABLE I.

<u>Test No.</u>	<u>Reagent Used</u>
1-A	Bear Brand (B.B.) potassium ethyl xanthate.
1-B	Dominion Rubber Co. (D.R.C.) potassium ethyl xanthate.
1-C	B.B. sodium ethyl xanthate.
1-D	D.R.C. sodium ethyl xanthate.

Flotation Conditions -

Grind - 83 per cent minus 200 mesh.
Reagents to Ball Mill: Soda ash, 4.0 lb./ton
NaCN, 0.10 "
Reagents to Cell: Xanthate, 0.10 lb./ton
Pine oil, 0.05 "
Conditioning time - 6 minutes.
Flotation time - 7 minutes.

Test No. 2(A-D). - Lead Ore.

The tests on the Lead Ore were made as shown in Table II.

TABLE II.

<u>Test No.</u>	<u>Reagent Used</u>
2-A	B.B. potassium ethyl xanthate.
2-B	D.R.C. " " "
2-C	B.B. sodium ethyl xanthate.
2-D	D.R.C. " " "

Flotation Conditions -

Grind - 73 per cent minus 200 mesh.
Reagents to Ball Mill: Soda ash, 1.0 lb./ton.
Zinc sulphate, 1.0 lb./ton.
NaCN, 0.5 lb./ton.
Sodium silicate, 1.0 lb./ton.
Reagents to Cell: Xanthate, 0.07 lb./ton.
" " " Pine oil, 0.03 lb./ton.
Cresylic acid, 0.03 lb./ton.
Conditioning time - 6 minutes.
Flotation time - 7 minutes.

(Investigative Procedure, cont'd) -

Test No. 3(A-D). - Pyrite Ore.

The tests on the Pyrite Ore were made as shown in Table III.

TABLE III.

<u>Test No.</u>	<u>Reagent Used</u>
3-A	B.B. potassium ethyl xanthate.
3-B	D.R.C. " " "
3-C	B.B. sodium ethyl xanthate.
3-D	D.R.C. " " "

Flotation Conditions -

Grind - 70 per cent minus 200 mesh.
Reagents to Ball Mill: Soda ash, 1.0 lb./ton.

Reagents to Cell: Xanthate, 0.1 lb./ton.
Pine oil, 0.05 lb./ton.

Conditioning time - 6 minutes.

Flotation time - 7 minutes.

EXPERIMENTAL RESULTS:

On Copper Ore.

The results of the test on the Copper Ore are tabulated in Table IV.

TABLE IV. - Comparative Test of Xanthates on Copper Ore.

<u>Test No.</u>	<u>Weight of Cu Concentrates, per cent</u>	<u>Assay of Concentrates, Cu, per cent</u>	<u>Assay of Tailing, Cu, per cent</u>	<u>Recovery of Copper, per cent</u>
1-A	15.0	13.97	0.082	96.8
1-B	16.4	11.16	0.14	94.0
1-C	18.3	10.94	0.11	95.7
1-D	18.4	9.35	0.14	93.8

(Continued on next page)

(Experimental Results, cont'd) -

Test No. 1-A. - Bear Brand Potassium Ethyl Xanthate.

Product	Weight, per cent	Assay, Cu, per cent	Distribution of Copper, per cent
Feed	100.0	2.17 ^o	100.0
Flotation conc.	15.0	13.97	96.8
Flotation tailing	85.0	0.082	3.2

Test No. 1-B. - Dominion Rubber Co.
Potassium Ethyl Xanthate.

Feed	100.0	1.95 ^o	100.0
Flotation conc.	16.4	11.16	94.0
Flotation tailing	83.6	0.14	6.0

Test No. 1-C. - Bear Brand Sodium Ethyl Xanthate.

Feed	100.0	2.09 ^o	100.0
Flotation conc.	18.3	10.94	95.7
Flotation tailing	81.7	0.11	4.3

Test No. 1-D. - Dominion Rubber Co. Sodium
Ethyl Xanthate.

Feed	100.0	1.84 ^o	100.0
Flotation conc.	18.4	9.35	93.8
Flotation tailing	81.6	0.14	6.2

^o Calculated.

Conclusions from Tests Nos. 1-A to 1-D -

Although the calculated copper content in the tests using Bear Brand xanthates were higher, it will be noted that the assay of the tailing was lower, indicating a slightly better collecting action. The Bear Brand reagents also had slightly better selectivity, the grade of copper concentrate being a little higher.

On Lead Ore.

The results of the test on the Lead Ore are tabulated in Table V.

(Continued on next page)

(Experimental Results, cont'd) -

TABLE V. - Comparative Test of Xanthates on Lead Ore.

Test No.	Weight of Pb Concentrates, per cent	Assay of Concentrates, Pb, per cent	Assay of Tailing Pb, per cent	Recovery of Lead, per cent
2-A	23.6	17.88	0.53	91.2
2-B	23.5	19.60	0.40	93.8
2-C	15.3	29.56	0.40	93.0
2-D	22.0	28.14	0.43	94.9

Test No. 2-A. - Bear Brand Potassium Ethyl Xanthate.

Product	Weight, per cent	Assay, Pb, per cent	Distribution of Lead, per cent
Feed	100.0	4.82*	100.0
Flotation conc.	23.6	17.88	91.2
Flotation tailing	76.4	0.53	8.8

Test No. 2-B. - Dominion Rubber Co. Potassium Ethyl Xanthate.

Feed	100.0	4.92*	100.0
Flotation conc.	23.5	19.60	93.8
Flotation tailing	76.5	0.40	6.2

Test No. 2-C. - Bear Brand Sodium Ethyl Xanthate.

Feed	100.0	4.85*	100.0
Flotation conc.	15.3	29.56	93.0
Flotation tailing	84.7	0.40	7.0

Test No. 2-D. - Dominion Rubber Co. Sodium Ethyl Xanthate.

Feed	100.0	6.53*	100.0
Flotation conc.	22.0	28.14	94.9
Flotation tailing	78.0	0.43	5.1

6

Calculated.

Conclusions from Tests Nos. 2-A to 2-D -

The Dominion Rubber Company's potassium ethyl xanthate showed better collecting action and selectivity than the Bear Brand potassium ethyl xanthate on lead ores. The Bear Brand sodium ethyl xanthate may have slightly better selectivity than the Dominion Rubber Company's sodium ethyl xanthate on lead ores but the collecting action would be

(Experimental Results, cont'd) -

slightly better with the Dominion Rubber Company's reagent. In this latter respect it will be noted in Test No. 2-D the calculated lead feed was higher than in 2-C but the assay of the tailings was almost the same.

On Pyrite Ore.

The results of the test on the Pyrite Ore are tabulated in Table VI.

TABLE VI. - Comparative Test of Xanthates on Pyrite Ore.

Test No.	Weight of Py Concentrates, per cent	Assay of Concentrates, S, per cent	Assay of Tailing, S, per cent	Recovery of Sulphur, per cent
3-A	4.5	26.22	0.76	62.0
3-B	4.7	24.90	0.74	62.6
3-C	4.5	27.17	0.79	61.6
3-D	5.0	20.02	0.86	55.1

Test No. 3-A. - Bear Brand Potassium Ethyl Xanthate.

Product	Weight, per cent	Assay, S, per cent	Distribution of Sulphur, per cent
Feed	100.0	1.91 [⊙]	100.0
Flotation conc.	4.5	26.22	62.0
Flotation tailing	95.5	0.76	38.0

Test No. 3-B. - Dominion Rubber Co. Potassium Ethyl Xanthate.

Product	Weight, per cent	Assay, S, per cent	Distribution of Sulphur, per cent
Feed	100.0	1.89 [⊙]	100.0
Flotation conc.	4.7	24.90	62.6
Flotation tailing	95.3	0.74	37.4

Test No. 3-C. - Bear Brand Sodium Ethyl Xanthate.

Product	Weight, per cent	Assay, S, per cent	Distribution of Sulphur, per cent
Feed	100.0	1.96 [⊙]	100.0
Flotation conc.	4.5	27.17	61.6
Flotation tailing	95.5	0.79	38.4

Test No. 3-D. - Dominion Rubber Co. Sodium Ethyl Xanthate.

Product	Weight, per cent	Assay, S, per cent	Distribution of Sulphur, per cent
Feed	100.0	1.82 [⊙]	100.0
Flotation conc.	5.0	20.02	55.1
Flotation tailing	95.0	0.86	44.9

⊙ Calculated.

(Continued on next page)

(Experimental Results, cont'd) -

Conclusions from Tests Nos. 3-A to 3-D -

There is very little difference between the two companies' brands of potassium ethyl xanthate, for pyrite flotation. The Bear Brand sodium ethyl xanthate would appear to be both more selective and to have greater collecting action for pyrite.

Conclusions:

1. The Dominion Rubber Company's xanthates, Potassium Ethyl and Sodium Ethyl, had slightly lower collecting action and slightly less selectivity on copper sulphides than did Bear Brand xanthates. This would indicate that in order to obtain the same recovery of copper in the concentrate, more Dominion Rubber Company reagent would be required, in which case the grade of concentrate would be slightly lower.
2. The Dominion Rubber Company's potassium ethyl xanthate showed better collection action and selectivity on lead sulphides than did the Bear Brand potassium ethyl xanthate. This would indicate a decrease in the amount of Dominion Rubber Company potassium ethyl xanthate necessary to give comparable results.
3. The Bear Brand sodium ethyl xanthate may have slightly better selectivity on lead sulphides than the Dominion Rubber Company's similar reagent, but in all probability the collecting action would be better with the Dominion Rubber Company's reagent. In general these reagents do not exhibit any great difference. The results should be confirmed in plant operation.
4. The potassium ethyl xanthates from both companies gave comparable results on the flotation of pyrite. A plant scale test should be made to determine the difference.

(Continued on next page)

(Conclusions, cont'd) -

5. The Dominion Rubber Company's sodium ethyl xanthate did not appear to have either the selectivity or the collecting power for pyrite that the Bear Brand sodium ethyl xanthate had. Increasing the amount of reagent would probably increase the recovery of pyrite but the grade would be lowered.

6. In general, the results of test work warrant further investigation, which could only be made under operating conditions.

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