Patented Apr. 11, 1950

2,503,479

UNITED STATES PATENT OFFICE

2,503,479

REMOVAL OF IMPURITIES FROM ZINC ELECTROLYTE SOLUTIONS

Dinsmore Laurence Griffith and Mavis Jean Rankin, Flin Flon, Manitoba, Canada, assignors to Hudson Bay Mining and Smelting Co., Limited, Winnipeg, Manitoba, Canada, a corporation of Canada

No Drawing. Application October 6, 1947, Serial No. 778,272. In Canada July 18, 1946

3 Claims. (Cl. 23—125)

1

This invention relates to the removal of impurities present in zinc electrolyte solutions prior to the recovery of zinc therefrom by the electrolytic method.

It has for many years been known that purification of an electrolyte may be effected by the displacement of one metal from the solution by another higher in the electromotive series and that such a displacement may be aided by the presence of a metal low in the electromotive series. Thus it is common, after iron and other metals have been precipitated by treating an electrolyte with zinc oxide or roasted zinc ore or lime while air is blown through the solution, to treat it with small amounts of zinc dust and to increase the purifying action of the zinc dust by using small amounts of copper and antimony along with the zinc dust.

On the basis of the above generalization as to removal of one metal in solution by another metal higher in the electromotive series, and this removal being aided by the presence of a metal low in the electromotive series, one would expect that all of the impurities could be removed without serious difficulties. It has, however, been found exceedingly difficult completely to precipitate from the electrolyte certain deleterious elements which greatly reduce the current efficiency obtainable and the quantity of which in the electrolyte should at all times be kept at a minimum.

We have observed that the difficulty in removing the deleterious elements is often, if not always, to be attributed to the ease with which they re-dissolve after precipitation, and have discovered that the use of small amounts of lead together with the usual amounts of zinc dust, copper and antimony, increases the degree of precipitation of the impurities, particularly cobalt and antimony, and slows the re-solution of these impurities so that the purification of the electrolyte becomes more complete and dependable. The quantity of lead used is not critical, but it has been found that a small quantity within the range of about 50 to about 200 milligrams per litre is sufficient.

Our discovery is illustrated by two experiments, lead being added to one, but not the other. In each case the experiment was carried out with a sample of tank house electrolyte containing about 120 grams per litre of zinc as sulphate, 20.6 milligrams per litre of cobalt, and 0.026 milligram per litre of antimony. To each of the samples were added 2.5 grams per litre of zinc dust, 0.7 gram per litre of copper as copper sulphate and 0.1 gram per litre of tartar emetic. 0.1 gram of lead as lead acetate was then added to the first sample only and the two mixtures were then agitated with wooden stirrers rotated at 110 revolutions per minute while they were held at 40° C. for four hours. Samples were taken at various intervals and the assays of the filtered product were as follows:

2

Time		Test No. 1, Lead Used		Test No. 2, No lead used	
Hrs.	Mins.	Cobalt, mg./l.	Antimony, mg./l.	Cobalt, mg./l.	Antimony, mg./l.
0	0	20.6	----------	20.6	----------
0	15	14.0	----------	11.2	----------
0	30	8.0	----------	7.0	----------
1	0	4.6	0.04	9.2	0.036
2	0	5.0	0.023	13.7	0.070
3	0	6.4	0.028	14.0	0.036
4	0	8.8	0.26	18.0	0.37

It will be observed that the degree of purification with respect both to cobalt and antimony was greater in test 1 than in test 2, that the reappearance of the impurities was much slower, indicating the slowing down of the re-solution of the cobalt and antimony, and that the final results after four hours showed less impurity in the case of the test carried out with lead additions.

The improvement in purification obtained is also illustrated by the following series of tests using a sample of tank house electrolyte containing about 120 grams per litre of zinc as sulphate, 0.6 milligram per litre of copper, 20.0 milligrams per litre of cobalt, 0.1 milligram per litre of antimony and no detectable quantity of lead. Since the above tests indicated that, with the particular stirring equipment used, the impurity content was the lowest after stirring for 85 minutes when lead was used and about 45 minutes when lead was not used, stirring was carried out for these periods. In the following table the quantities of zinc dust, copper, tartar emetic and lead are given for each test, as well as the filter assays, and "ND" indicates "not detectable."

Test No.	Purification Reag., g./l.				Agitation Time, Min.	Filtrate assay, mg./l.			
	Zn Dust	Cu	Tartar Emetic	Pb		Cu	Co	Sb	Pb
C-1	3	.84	.12	0	45	.8	4.0	0.14	ND
C-2	3	.84	.12	.1	85	.5	2.2	.038	ND
C-3	2	.56	.08	0	45	2.2	11.2	.12	ND
C-4	2	.56	.08	.1	85	1.6	5.8	.085	ND
C-5	1	.28	.04	0	45	1.6	15.6	.40	ND
C-6	1	.28	.04	.1	85	.4	13.6	.20	.2

What we claim is:

1. A method of removing impurities from zinc electrolyte solutions, comprising adding to the electrolyte small amounts of zinc dust, copper sulphate, tartar emetic, and from about 50 to about 200 milligrams per litre of lead acetate.

2. A method of removing impurities from zinc electrolyte solutions, comprising contacting the electrolyte with small amounts of zinc dust in the presence of small amounts of soluble copper and antimony compounds and from about 50 to about 200 milligrams per litre of lead in the form of a soluble compound.

3. A method of removing impurities from zinc electrolyte solutions comprising adding to the

electrolyte small amounts of zinc dust, copper sulphate, a soluble compound of antimony and from about 50 to about 200 milligrams per litre of lead in the form of a soluble compound.

DINSMORE LAURENCE GRIFFITH.
MAVIS JEAN RANKIN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,396,569	Griffith et al.	Mar. 12, 1946