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MONSANTO CHEMICAL COMPANY - UNIT III

DAYTON, OHIO

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Date:

2/17/80

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Laboratory Director

ELECTRODEPOSITION RESEARCH PROGRESS REPORT

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ELECTRODEPOSITION RESEARCH GROUP

W. Abel, R. Bell, G. Neibel, E. Orban, and W. Raiff

ABSTRACT

Plating of Postum from Hydrofluoric Acid Solutions

Solution Conversion

A cold run was made on the conversion of production nitric acid solutions to hydrofluoric acid solutions. It was found that, although not all the bismuth was removed in the hydrofluoric acid plating solution, there was a tenfold improvement over the amount in the production solution.

Miscellaneous

Hydrogen and calomel half cells have been constructed and are being checked against each other to determine whether the calomel half cells are at the correct potential and whether they check each other.

DETAILED REPORT

I. Plating of Postum from Hydrofluoric Acid Solutions

A. Plate Quality

1. Neutron Emission

The inoperative neutron counter has been repaired. The study of the change of neutron emission with time, which was halted by the breakdown, will be started over.

2. Adherence of Plate

This work has been temporarily interrupted for work of greater urgency.

3. Photographic Examination of Foils

No foils of interest for this work have been produced during this period.

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B. Solution Conversion

1. Conversion of Production Solutions to Bismuth-free Postum Solutions of Hydrofluoric Acid - (One Person)

In an effort to determine the efficiency of separation of bismuth from postum in production solutions a cold run using a solution containing only bismuth was made. The following steps were used:

a. One hundred ml. of bismuth solution containing 0.1016 gm. bismuth ion per 100 ml. was precipitated using excess saturated sodium carbonate solution.

b. The solution was filtered and washed twice (using a "Teflon" filter stick), collecting all rinse waters and original filtrate.

c. Ten ml. of 10 N hydrofluoric acid solution at 60°C. was added, and the solution and precipitate were stirred under heating for forty-five minutes.

d. After the solution cooled, it was filtered again through the "Teflon" filter stick, and washed. The filtrate and wash waters were collected as before. (Designated as Filtrate #2).

e. The remaining precipitate was dissolved in concentrated nitric acid, and the resulting solution was diluted to 2 N nitric acid. (Designated as Precipitate Solution).

The three solutions were analyzed quantitatively in the following manner: They were evaporated to dryness in a weighed platinum dish. The residue was digested in 27 N hydrofluoric acid, then filtered and washed. The residue was evaporated to dryness and weighed. The results are tabulated in Table I.

Table I

ANALYSIS OF BISMUTH SOLUTIONS

<u>Solution</u>	<u>Gm. of Bismuth</u>
Filtrate #1	0.0172
Filtrate #2	0.0102
Precipitate Solution	0.0610
Unaccounted for	0.0122

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The bismuth unaccounted for was probably lost during the analysis when the residues were washed with concentrated hydrofluoric acid and filtered. The amount lost was due to a small quantity of suspended material passing through the "Teflon" filter stick, and to a small amount of bismuth trifluoride being dissolved in the hydrofluoric acid.

The most desirable results would have been for all the bismuth to be in the first filtrate and the precipitate solution. The fact that some remained in the second filtrate indicated again that the "Teflon" filter may be too porous and that a small amount was dissolving in the hydrofluoric acid. Notwithstanding, this method shows at least a tenfold improvement in the amount of bismuth present in the plating solution; and with this improvement goes the reduced chance of plating out bismuth in the final plating run.

FUTURE PLANS

Several cold runs will be made to refine the technique; then a "hot" run will be tried.

II. Plating of Postum from Nitric Acid and other Media

FUTURE PLANS

The problem has been assigned, and work on plating of postum on copper out of nitric acid will be started very shortly.

III. The Solubility of Postum in Various Media

This work was temporarily halted, but it is hoped that in the near future there will be some progress to report.

IV. Miscellaneous - (Two Persons)

A good deal of time has been spent in cleaning up hoods, constructing and altering equipment.

Twelve new calomel electrodes were made, and several hydrogen electrodes were constructed. It is planned to check each calomel electrode to the standard hydrogen electrode. In this way we can be positive that we are operating at the correct potentials. The equipment has been set up and details of the measurements will be reported next time.

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