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LEAD PLATING FROM FLUOBORATE SOLUTIONS

Summary

Details of this investigation were published in an article by W. Blum, F. J. Liscomb, Zalia Jencks and W. E. Bailey in the Trans. Amer. Electrochem. Soc., 36, 243 (1919).

Lead plating was used extensively during the war for lining gas shells and for increasing the weight of underweight shells. Satisfactory results were obtained from both fluosilicate and fluoborate solutions. The latter were however preferable, because (1) they can be more readily prepared, (2) with them adherent deposits can be produced directly upon steel without previous copper plating, (3) they are more stable than fluosilicates, and (4) the deposits are more dense. Lead plating may find commercial uses where resistance to the action of acids or other chemicals is required. Lead is not so satisfactory as zinc for protecting steel against ordinary atmospheric corrosion.

The exact formula of fluoboric acid is uncertain, but for simplicity it may be considered as HBF_4. It is prepared by mixing hydrofluoric and boric acids. Lead fluoborate solutions are produced by dissolving basic lead carbonate (white lead) in this solution. As the commercial hydrofluoric acid always contains some sulphuric acid as an impurity, a white precipitate of lead sulphate is formed, from which the fluoborate solution is decanted. Glue is added in small quantities to the solution in order to produce smoother deposits of lead.

The operating conditions which were found favorable are as follows:

Composition (based on commercial materials):

	g/L	oz/gal
Basic lead carbonate.....	150	20
50% hydrofluoric acid.....	240	32
Boric acid.....	105	14
Glue.....	0.2	0.025

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This solution has a specific gravity of about 1.17 (21°Be). For very thick deposits, or for rapid deposition, solutions with twice the above concentrations may be used. Small amounts of glue should be added whenever the deposits show any tendency toward roughness or "treeing".

For thin deposits it is possible to use current densities up to 2 amp./dm^2 (19 amp./sq.ft.), but for thick deposits not over 1 amp./dm^2 (9 amp./sq.ft.) should be used. Mechanical agitation is desirable when plating in confined spaces. Wherever practicable the surface should be cleaned for plating by sand blasting instead of by pickling. For most purposes a thickness of 0.003" to 0.005" (0.075 to 0.125) is sufficient, but for resistance to very corrosive chemicals, heavier coatings are desirable. Dense deposits having a thickness of over 0.07" (1.75 mm) have been produced on a commercial scale. It requires 7 ampere hours per square foot to produce a deposit of lead 0.001" in thickness, which weighs approximately 1 oz./sq.ft.