

Specification for

Fluoroboric acid and metal fluoroborates for electroplating

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Assay Offices Committee of Great Britain	Institute of Metal Finishing*
Association of Metal Sprayers	Institute of Sheet Metal Engineers
British Bolt, Nut, Screw and Rivet Federation	Institute of Vitreous Enamellers
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Electricity Supply Industry in England and Wales*	Tin Research Institute*
Electronic Engineering Association*	Vitreous Enamel Development Council
Engineering Equipment Users' Association	Zinc Development Association*

The scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

Institution of Chemical Engineers	Society of Chemical Industry
Scientific Instruments Manufacturers' Association	United Kingdom Cutlery and Silverware Manufacturers' Association

This British Standard, having been approved by the Surface Coatings (other than paints) Industry Standards Committee, was published under the authority of the Executive Board on 29 November 1974

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Foreword

This British Standard is one of a series of standards that has been prepared to meet the requirements of electroplaters, others in the series being:

BS 558 & BS 564, *Nickel anodes, anode nickel and nickel salts for electroplating.*

BS 622, *Potassium and sodium cyanides for electroplating.*

BS 1468, *Tin anodes and tin salts for electroplating.*

BS 1561, *Silver anodes and silver salts for electroplating.*

BS 2656, *Zinc anodes, zinc oxide and zinc salts for electroplating.*

BS 2868, *Cadmium anodes and cadmium oxide for electroplating.*

BS 4493, *Copper salts for electroplating.*

NOTE 1 The analytical reagents referred to in this standard are presented in accordance with the requirements of BS 4245 "*Recommendations for solutions used in chemical analysis. Terminology, presentation and concentration*".

NOTE 2 Apparatus and reagents for use in analytical methods are given in Appendix A.

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard specifies requirements for concentrated solutions¹⁾ of fluoroboric acid, lead fluoroborate, stannous fluoroborate, copper fluoroborate and zinc fluoroborate which are used for the preparation of electroplating solutions.

2 Reference

The title of the British Standard referred to in this standard is given on the inside back cover.

3 Fluoroboric acid

3.1 Physical form. The material shall be a clear, colourless or nearly colourless aqueous solution of fluoroboric acid.

3.2 Chemical composition

3.2.1 The material shall contain not less than 520 g/l of fluoroboric acid calculated as HBF_4 when determined by the method described in Appendix B.

3.2.2 The material shall contain not less than 10 g/l and not more than 60 g/l of free boric acid calculated as H_3BO_3 when determined by the method described in Appendix C.

3.3 Impurities. The impurities present in fluoroboric acid shall not exceed the following limits when determined by the method described in the appropriate appendix:

Impurity	Concentration max.	Appendix
	g/l	
Sulphate calculated as SO_4	5.0	G
Silica calculated as SiO_2	10.0	F
Iron calculated as Fe	0.5	H
Heavy metals other than iron	1.0	J
Chloride calculated as Cl	0.1	K

3.4 Sampling and size of sample. A representative sample of the material of not less than 250 ml is necessary for the purposes of examination under this British Standard. The sample shall be packed in a suitable closed, clean, dry plastics bottle fitted with a rubber or plastics stopper.

NOTE Fluoroboric acid is a strong acid and should be handled with care.

4 Lead fluoroborate solution

4.1 Physical form and appearance. Lead fluoroborate solution for electroplating shall be a clear, colourless or nearly colourless aqueous solution.

4.2 Chemical composition

4.2.1 The material shall contain not less than 500 g/l of lead calculated as metal, when determined by the method described in Appendix L.

4.2.2 The material shall contain not more than 35 g/l of free fluoroboric acid calculated as HBF_4 when determined by the method described in Appendix D.

4.2.3 The material shall contain not less than 10 g/l and not more than 60 g/l of free boric acid calculated as H_3BO_3 when determined by the method described in Appendix E.

4.3 Impurities. The amount of impurities present in lead fluoroborate solution shall not exceed the following limits when determined by the method described in the appropriate appendix:

Impurity	Concentration max.	Appendix
	g/l	
Silica calculated as SiO_2	10.0	F
Iron calculated as Fe	1.0	H

4.4 Sampling and size of sample. A representative sample of the material of not less than 250 ml is necessary for the purposes of examination under this British Standard. The sample shall be packed in a suitable closed, clean, dry plastics bottle fitted with a rubber or plastics stopper.

5 Tin fluoroborate solution

5.1 Physical form and appearance. Tin fluoroborate solution for electroplating shall be a clear, colourless or nearly colourless aqueous solution.

5.2 Chemical composition

5.2.1 The material shall contain not less than 300 g/l of tin in the stannous form calculated as metal when determined by the method described in Appendix M.

¹⁾ These metal fluoroborate concentrates require dilution and additions to render them suitable for electroplating.

5.2.2 The material shall contain not less than 10 g/l and not more than 60 g/l free boric acid calculated as H_3BO_3 when determined by the method described in Appendix E.

NOTE The free fluoroboric acid in stannous fluoroborate concentrates is not amenable to simple chemical analysis owing to hydrolysis. As, however, concentrates with widely different free fluoroboric acid contents all appear equally satisfactory when used in electroplating baths, no limits for free acid are prescribed in this standard.

5.3 Impurities. The amount of impurities present in tin fluoroborate solution shall not exceed the following limits when determined by the method described in the appropriate appendix:

Impurity	Concentration max.	Appendix
	g/l	
Sulphate calculated as SO_4	5.0	G
Silica calculated as SiO_2	10.0	F
Iron calculated as Fe	2.0	H
Chloride calculated as Cl	1.0	K
Copper calculated as Cu	0.05	N

5.4 Sampling and size of sample. A representative sample of the material of not less than 250 ml is necessary for the purposes of examination under this British Standard. The sample shall be packed in a suitable closed, clean, dry plastics bottle fitted with a rubber or plastics stopper.

6 Copper fluoroborate solution

6.1 Physical form and appearance. Copper fluoroborate solution for electroplating shall be a clear, blue, aqueous solution.

6.2 Chemical composition

6.2.1 The material shall contain not less than 200 g/l copper calculated as metal when determined by one of the methods described in Appendix P.

6.2.2 The material shall contain not more than 35 g/l of free fluoroboric acid calculated as HBF_4 when determined by the method in Appendix D.

6.2.3 The material shall contain not less than 10 g/l and not more than 60 g/l of free boric acid calculated as H_3BO_3 when determined by the method described in Appendix E.

6.3 Impurities. The amount of impurities present in copper fluoroborate solution shall not exceed the following limits when determined by the method described in the appropriate appendix:

Impurity	Concentration max.	Appendix
	g/l	
Silica calculated as SiO_2	10.0	F
Sulphate calculated as SO_4	5.0	G
Iron calculated as Fe	2.0	H

6.4 Sampling and size of sample. A representative sample of the material of not less than 250 ml is necessary for the purposes of examination under this British Standard. The sample shall be packed in a suitable closed, clean, dry plastics bottle fitted with a rubber or plastics stopper.

7 Zinc fluoroborate solution

7.1 Physical form and appearance. Zinc fluoroborate solution for electroplating shall be a clear, colourless or nearly colourless, aqueous solution.

7.2 Chemical composition

7.2.1 The material shall contain not less than 200 g/l of zinc calculated as metal when determined by the method described in Appendix Q.

7.2.2 The material shall contain not more than 20 g/l free fluoroboric acid calculated as HBF_4 when determined by the method in Appendix D.

7.2.3 The material shall contain not less than 10 g/l and not more than 60 g/l free boric acid calculated as H_3BO_3 when determined by the method described in Appendix E.