

Specifications for

Nickel anodes, anode nickel and nickel salts for electroplating

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Co-operating organizations

The Surface Coatings (other than paints) Industry Standards Committee, under whose supervision these British Standards were prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

- Aluminium Federation
- Assay Offices Committee of Great Britain
- Association of Metal Sprayers
- British Bolt, Nut, Screw and Rivet Federation
- British Electrical and Allied Manufacturers' Association
- British Jewellers' Association
- British Non-ferrous Metals Research Association*
- British Steel Industry
- Chemical Industries Association*
- Cycle and Motor Cycle Association Limited*
- Electricity Council, the Central Electricity Generating Board and the Area Boards in England and Wales
- Electronic Engineering Association
- Engineering Equipment Users' Association
- Greater London Council
- Institute of Metal Finishing*
- Institute of Sheet Metal Engineers
- Institute of Vitreous Enamellers
- Metal Finishing Association*
- Ministry of Defence, Army Department
- Ministry of Defence, Navy Department
- Ministry of Technology
- Society of Motor Manufacturers and Traders Limited*
- Tin Research Institute*
- Vitreous Enamel Development Council
- 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 these British Standards:

- British Metal Finishing Suppliers' Association
- British Sulphate of Copper Association
- Institution of Chemical Engineers
- Royal Institute of Chemistry
- Scientific Instruments Manufacturers' Association
- Society of Chemical Industry
- United Kingdom Cutlery and Silverware Manufacturers' Association
- Individual firms

These British Standards, having been approved by the Surface Coatings (other than Paints) Industry Standards Committee, were published under the authority of the Executive Board on 23 October 1970

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Foreword

These standards make reference to the following British Standards:

BS 1647, *pH scale*.

BS 3591, *Industrial methylated spirit*.

BS 3978, *Water for laboratory use*.

BS 4245, *Recommendations for solutions used in chemical analysis. Terminology, presentation and concentration*.

These British Standards are part of a series of standards that has been prepared to meet the requirements of electroplaters, others in the series being:

BS 622, *Potassium and sodium cyanide 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 cyanide and zinc oxide for electroplating*.

BS 2657, *Fluoroboric acid and metallic fluoroborates 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 these standards are presented in accordance with BS 4245 “Recommendations for solutions used in chemical analysis. Terminology, presentation and concentration”.

NOTE 2 Attention is drawn to certification facilities offered by BSI; see the 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.

BS 558:1970 Nickel anodes and anode nickel for electroplating

1 Scope

This British Standard specifies requirements for nickel anodes and anode nickel for electroplating.

2 General

2.1 Type A rolled, cast or extruded anodes are fabricated in bar form of elliptical cross section from material specially designed to dissolve smoothly and give minimum metallic losses.

Type A1 oxide-containing anodes are normally used for solutions, without organic additives whereas Type A2 carbon-containing anodes are generally recommended for solutions to which organic materials are added to modify the structure of the nickel deposit to give bright and/or levelled deposits. Anodes for use in inclined barrels are normally cast in disc form and are made from Type A1 material.

2.2 Type B anode nickel may be in squares, pieces or strip cut from electrolytically refined nickel cathode. Squares or small pieces of cathode nickel are normally used in anode baskets, and cathode strip with attached hooks or clamps can be used in the same manner as Type A anodes.

A form of Type B anode nickel contains sulphur deliberately added to activate the nickel and to ensure smooth dissolution with minimum metallic losses when used either in anode baskets or in the form of strip.

3 Chemical composition

3.1 Type A rolled, cast and extruded anodes.

Nickel anodes shall contain not less than 99.00 % of nickel plus cobalt and the nickel content, obtained by difference after the determination of cobalt and impurities, shall be not less than 98.00 %. The cobalt shall be determined by the method described in Appendix D and the impurities (see Clause 4) shall be determined by the method described in the appropriate appendix.

3.2 Type B anode nickel. Anode nickel shall contain not less than 99.9 % of nickel plus cobalt and the nickel content, obtained by difference after the determination of cobalt and impurities, shall be not less than 99.0 %. The cobalt shall be determined by the method described in Appendix D and the impurities (see Clause 4) shall be determined by the method described in the appropriate appendix.

4 Impurities

The amount of individual impurities present in nickel anodes and anode nickel shall not exceed the following limits when determined by the method described in the appropriate appendix:

Impurity	% (maximum)		Appendix
	Type A	Type B	
Iron calculated as Fe	0.30	0.05	Appendix E
Lead calculated as Pb	0.01	0.005	Appendix F
Copper calculated as Cu	0.25	0.02	Appendix G
Zinc calculated as Zn	0.01	0.005	Appendix H

NOTE Some elements that do not contaminate the plating solutions are also present in nickel anodes and anode nickel.

In Type A1 anodes, sulphur is normally present within the range 0.004 – 0.012 % and nickel oxide is normally present within the range 0.1 – 1.25 %.

In Type A2 anodes, sulphur is normally present within the range 0.008 – 0.020 % and carbon and silicon are both normally present, each within the range of 0.2 – 0.5 %.

In Type B anode nickel, sulphur is sometimes added and is normally present within the range of 0.01 – 0.04 %.

5 Selection of test samples

When an analysis is required by the purchaser, the samples of anodes for testing shall be selected in the manner described in Appendix A.

6 Information to be supplied by the purchaser to the supplier

The following information shall be supplied by the purchaser to the supplier:

- 1) The number of this British Standard i.e. BS 558.
- 2) The type of anode or anode nickel required i.e. Type A1, Type A2 or Type B.
- 3) In the case of Type A1 and Type B, the shape or form of the anode or anode nickel.
- 4) If an analysis is required, this shall be stated.

BS 564:1970 Nickel salts for electroplating

1 Scope

This British Standard specifies requirements for nickel sulphate, nickel chloride, nickel sulphamate solution and nickel carbonate for electroplating.

2 Nickel sulphate

2.1 General. Nickel sulphate shall be in either crystal or powder form and may be a mixture of hydrates, but the composition shall fall between the limits represented by the formulae $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ and $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$.

2.2 Chemical composition. The material shall contain not less than 20.7 % of nickel and cobalt (calculated as metal) when determined by the method described in Appendix C, the percentage of cobalt being not more than 1.0 % of the total metal content when determined by the method described in Appendix D.

2.3 Impurities. The amount of impurities present in the nickel sulphate shall not exceed the following limits when determined by the method described in the appropriate appendix:

Impurity	% (maximum)	Appendix
Iron, calculated as Fe	0.005	Appendix E
Lead, calculated as Pb	0.002	Appendix F
Copper, calculated as Cu	0.002	Appendix G
Zinc, calculated as Zn	0.002	Appendix H

2.4 Insoluble matter. The total matter insoluble in water when determined by the method described in Appendix J shall not exceed 0.05 %.

2.5 Acidity. The pH value of a solution of the salt shall be not less than 2.0 when determined by the method described in Appendix K.

2.6 Sampling and size of sample. A representative sample of the material weighing not less than 250 g is necessary for the purposes of examination under this British Standard. The sample shall be packed in a clean, dry and airtight bottle and sealed.

3 Nickel chloride

3.1 General. Nickel chloride shall be in either crystal or powder form and its composition shall correspond approximately to the formula $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$.

3.2 Chemical composition. The material shall contain not less than 24 % of nickel and cobalt (calculated as metal) when determined by the method described in Appendix C, the amount of cobalt being not more than 1.0 % of the total metal content when determined by the method described in Appendix D.

3.3 Impurities. The amount of impurities present in the nickel chloride shall not exceed the following limits when determined by the method described in the appropriate appendix:

Impurity	% (maximum)	Appendix
Iron, calculated as Fe	0.01	Appendix E
Lead, calculated as Pb	0.002	Appendix F
Copper, calculated as Cu	0.005	Appendix G
Zinc, calculated as Zn	0.002	Appendix H

3.4 Insoluble matter. The total matter insoluble in water when determined by the method described in Appendix J shall not exceed 0.05 %.

3.5 Acidity. The pH value of a solution of the salt in water shall be not less than 2.0 when determined by the method described in Appendix K.

3.6 Sampling and size of sample. A representative sample of the material weighing not less than 250 g is necessary for the purposes of examination under this British Standard. The sample shall be packed in a clean, dry and airtight bottle and sealed.

4 Nickel sulphamate solution

4.1 General. Nickel sulphamate solution shall contain approximately 60 % by weight of the salt $\text{Ni}(\text{SO}_3\text{NH}_2)_2 \cdot 4\text{H}_2\text{O}$. The solution has a relative density of about 1.5.

4.2 Chemical composition. The solution shall contain not less than 10.8 % (m/m) of nickel and cobalt (calculated as metal) when determined by the method described in Appendix C, the amount of cobalt being not more than 1.0 % of the total metal content when determined by the method described in Appendix D.