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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 20251-2006

Nickel foam for battery

电池用泡沫镍

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Standardization Administration of the PRC

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Foreword

GB/T 20251-2006 was issued on 25 May 2006 by the General Administration of Quality Supervision, Inspection and Quarantine and the Standardization Administration of the People's Republic of China, and has been in force since 1 December 2006.

The document is a recommended national standard: the /T in the designation marks it as recommended rather than compulsory.

1 Scope

China's national standard for the nickel foam used in batteries. Nickel foam is an open-cell

metallic sponge - a three-dimensional network of nickel with a porosity above 95 % - made by nickel-plating a polyurethane foam and then burning the polymer away, leaving a hollow metal skeleton with the foam's structure. Its value is surface area combined with conductivity: a few millimetres of it presents an enormous internal surface that is also a continuous electrical conductor, which is exactly what a battery electrode needs. It is the current collector of the nickel-cadmium, nickel-zinc and nickel-metal hydride cells covered here, and the substrate on which the active material is pasted. What the specification turns on is the pore count, the areal density and the mechanical strength, since the foam must survive being pasted, pressed and wound without tearing. The standard specifies the requirements, the test methods, the inspection rules, the marking, packaging, transport and storage, and the contract contents.

This standard specifies the requirements, the test methods, the inspection rules, the marking, packaging, transport and storage, and the contract contents for nickel foam for batteries.

This standard applies to nickel foam for alkaline storage batteries such as nickel-cadmium, nickel-zinc and nickel-metal hydride.

2 Normative references

The following documents contain provisions which, through reference in this standard, constitute provisions of this standard. For dated references, subsequent amendments (excluding corrections) or revisions do not apply; however, parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions. For undated references, the latest edition applies.

GB/T 228 Metallic materials - Tensile testing at ambient temperature

GB/T 5164 Permeable sintered metal materials - Determination of open porosity

GB/T 8647 Methods for chemical analysis of nickel

GB/T 9174-1988 General specification for freight packing of ordinary cargo

3 Terms and definitions

3.1 pore number - the number of pores within a length of 2.54 cm (one inch) on the surface of the nickel foam. Note: the unit of pore number is PPI (pores per inch).

3.2 thickness deposit ratio, TDR - the ratio characterising the deposited thickness of nickel between the surface layer and the inner layer of the nickel foam.

4.1 Product classification

According to the method of production, nickel foam is divided into two kinds: coiled strip and

sheet-form block.

4.2 Chemical composition

The chemical composition of the nickel foam shall comply with Table 1, in per cent.

Nickel plus cobalt not less than 99.7. Impurity content by mass fraction, not greater than: carbon 0.030; sulfur 0.008; iron 0.020; copper 0.010; silicon 0.005; phosphorus 0.20.

4.3 Dimensions and permissible deviations

The dimensions and the permissible deviations of the nickel foam shall comply with Table 2.

Length less than 400 m with a permissible deviation of plus or minus 50 mm; width up to 0.5 m with a permissible deviation of plus or minus 0.5 mm and width above 0.5 m with a permissible deviation of plus or minus 1 mm; thickness up to 2.5 mm with a permissible deviation of plus or minus 0.05 mm; and not more than four joints within every 200 m of length, with the shortest distance between two joints not less than 20 m.

Note: where the purchaser has special requirements for the dimensions and their permissible deviations, these may be agreed between supplier and purchaser and noted in the contract. The length and joint number indicators apply to coiled strip nickel foam. Nickel foam thicker than 2.5 mm should not use the thickness indicator given, and its specific requirements shall be agreed separately between supplier and purchaser.

4.4 Mechanical properties

The room temperature mechanical properties of the nickel foam shall comply with Table 3.

Tensile strength Rm not less than 1.25 N/mm2 in the longitudinal direction and not less than 0.90 N/mm2 in the transverse direction. Elongation after fracture A not less than 5.0 % longitudinally and not less than 10.0 % transversely. Flexibility, expressed as the number of bends without fracture in the longitudinal direction: not less than 7 for thickness up to 1.6 mm; not less than 6 for thickness above 1.6 mm and up to 1.8 mm; not less than 5 for thickness above 1.8 mm and up to 2.0 mm; and not less than 4 for thickness above 2.0 mm and up to 2.5 mm. In the transverse direction not less than 15.

Note 1: the tensile strength values in the table apply to nickel foam of 500 g/m2 areal density and 1.6 mm thickness. At the same thickness, for every 1 g/m2 reduction in areal density the tensile strength value shall be reduced correspondingly by 0.003 N/mm2; at the same areal density, the tensile strength value is inversely proportional to the thickness.

Note 2: nickel foam of more than 2.5 mm thickness or more than 600 g/m2 areal density shall not use the indicators in the table, and its specific requirements shall be agreed separately between supplier and purchaser.

Note 3: nickel foam with a pore number above 110 PPI, or an areal density of 550 g/m2 or

more, or an areal density of 300 g/m2 or less, should not use the flexibility values in the table, and the specific values shall be agreed separately.

The indicator values in the table are the average results of the samples, and the number of samples below the standard value shall not exceed two.

4.5 Physical properties

The physical properties of the nickel foam shall comply with Table 4.

Areal density 300 to 600 g/m2, with a permissible deviation of plus or minus 8 % below 400 g/m2 and plus or minus 7 % at 400 g/m2 and above. Pore number 60 to 140 PPI, with a permissible deviation of plus or minus 10 PPI. Porosity not less than 95.0 %.

4.6 Appearance quality

4.6.1 The surface of the nickel foam shall have a silver-grey metallic lustre and shall be clean.

4.6.2 Slight water marks and micro spots are permitted on the nickel foam.

4.6.3 The nickel foam shall be free from cracks and from visible carbon black and missing plating.

4.6.4 The nickel foam shall have no through-holes larger than 2 mm in diameter, no nickel skin longer than 2 mm and no scratches longer than 3 mm. Within each square metre, the total number of defects consisting of through-holes 1 mm to 2 mm in diameter, nickel skin 1 mm to 2 mm long and scratches 2 mm to 3 mm long shall not exceed ten.

4.6.5 After the edges of coiled strip nickel foam have been trimmed, the strip shall be wound evenly.

4.7 Other requirements

Where the purchaser has other special requirements for the nickel foam, such as the thickness deposit ratio (TDR) or the resistivity, these shall be agreed between supplier and purchaser and noted in the contract.

5.1 Method of analysis of the chemical composition

The analysis of the chemical composition of the nickel foam shall be carried out in accordance with GB/T 8647.

5.2 Inspection of dimensions and permissible deviations

5.2.1 Length: sheet-form block nickel foam is measured with a straight rule; coiled strip nickel foam is measured with a length meter.