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Powder extinguishing agent

干粉灭火剂

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Powder extinguishing agent

1 Scope

This Standard specifies the terms and definitions, models, technical requirements, test methods, inspection rules, marks, packaging, transportation and storage for powder extinguishing agent.

This Standard applies to powder extinguishing agent whose major chemical content is not less than 75%. It is not suitable for ultra-fine powder extinguishing agent specified in GA 578 and Class D powder extinguishing agent specified in GA 979.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 535, *Fertilizer grade ammonium sulphate*

GB/T 622, *Chemical reagent - Hydrochloric acid*

GB 4351.1, *Portable fire extinguishers - Part 1: Performance and construction*

GB/T 4509, *Standard test method for penetration of bitumen*

GB/T 4968, *Classification of fires*

GB/T 5907 (all parts), *Fire protection vocabulary*

GB/T 6003.1, *Test sieves - Technical requirements and testing - Part 1: Test sieves of metal wire cloth*

GB/T 6682, *Water for analytical laboratory use - Specification and test methods*

GB/T 9969, *General principles for preparation of instructions for use of industrial products*

GA 578, *Super fine powder fire extinguishing agent*

GA 634, *Adiabatic protective clothing for firefighter*

GA 979, *Fire extinguishing media. D power*

3 Terms and definitions

For the purposes of this document, the terms and definitions defined in GB/T 5907 and GB/T 4968 as well as the followings apply.

3.1 characterization statement

The data and information on the physical or chemical properties of powder extinguishing agent provided by the manufacturer or the inspection entrusting party. It includes the content of chemical content, bulk density, particle size distribution, fire extinguishing performance, etc.

3.2 chemical content

The basic component of powder extinguishing agent. Additives used to improve extinguishing agent storage, moisture resistance, fluidity, etc. are not included.

3.3 major chemical content

Among the chemical contents of powder extinguishing agent, the chemical content with the highest content.

3.4 batch

Uniformed products that are produced according to the same formula and the same process, one-time feeding and production.

3.5 lot

Multiple batches of products under the same formula, process, and raw materials. The total amount shall not exceed 25 t.

NOTE: Any major changes in production personnel, manufacturing process, raw materials or environmental conditions are considered as different lots.

4 Models

The model of powder extinguishing agent is represented by a combination of fire type codes applicable to firefighting, chemical content and amount, and enterprise-defined information. The total content of chemical contents shall not be less than 90%.

b) Weighing bottle: ϕ70 mm × 40 mm;

c) Desiccator: ϕ220 mm;

d) Balance: accuracy is 0.2 mg.

6.3.2 Test steps

6.3.2.1 In the weighing bottle with constant weight, weigh 5 g of powder extinguishing agent specimen, accurate to 0.2 mg.

6.3.2.2 Place the weighing bottle without the cap in the desiccator filled with sulfuric acid at a temperature of 20°C±2°C for 48 h.

6.3.2.3 Take out the weighing bottle and put it in the desiccator. Weigh after standing for 15 min, accurate to 0.2 mg.

6.3.3 Results

Moisture content x_1 is calculated according to formula (2):

$$x_1 = \frac{m_1 - m_2}{m_1} \times 100\ \% \qquad \cdots\cdots (2)$$

Where,

m_1 - the mass of the specimen before drying, in grams (g);

m_2 - the mass of the specimen after drying, in grams (g).

Take the average of the two test results with a difference of not more than 0.02% as the measurement result.

6.4 Moisture absorption rate

6.4.1 Reagents, instruments and equipment

The requirements for reagents, instruments, and equipment for the moisture absorption rate test are as follows:

a) Ammonium chloride: chemically pure;

b) Balance: accuracy is 0.2 mg;

c) Weighing bottle: ϕ50 mm × 30 mm;

d) Desiccator: ϕ220 mm;

e) Constant temperature and humidity system: saturated ammonium chloride

6 - base.

Figure 2 -- Liquidity tester

6.5.2 Test steps

6.5.2.1 Weigh 300 g of powder extinguishing agent specimen, accurate to 0.5 g. Put it into the glass sand clock.

6.5.2.2 Mount the glass sand clock on the stand. Turn the specimen continuously in the sand clock for 30 s. After inflating the specimen, immediately start measuring the time for 20 consecutive free passages through the middle of the neck.

6.5.3 Results

Take the arithmetic mean value of 20 test times as the measurement result.

6.6 Water repellency

6.6.1 Reagents and instruments

The requirements for the reagents and instruments for water repellency test are as follows:

a) Sodium chloride: chemically pure;

b) Petri dish: ϕ70 mm;

c) Pipette: 0.5 mL;

d) Desiccator: ϕ220 mm.

6.6.2 Test steps

6.6.2.1 Put an excess powder extinguishing agent specimen in the petri dish. Use a spatula to smooth the surface.

6.6.2.2 Use a pipette to drop 0.3 mL of grade three water at three different points on the surface of the dry powder (according to the provisions of GB/T 6682). The distance between the dripping points and between the dripping points and the edge of the petri dish shall not be less than 10 mm.

6.6.2.3 Place the petri dish in a desiccator filled with saturated sodium chloride solution at a temperature of (20±5)°C (relative humidity is 75%). The time for placement is (120±5) min.

6.6.2.4 Remove the Petri dish. Gradually tilt to make the drops roll off.

6.6.3 Results

Observe whether the specimen has obvious water absorption and agglomeration.

6.7 Penetration

6.7.1 Reagents, instruments and equipment

The requirements for the reagents, instruments, and equipment for the penetration test are as follows:

a) Ammonium chloride: chemically pure;

b) Saturated ammonium chloride constant humidity system or constant temperature and humidity box: The saturated ammonium chloride constant humidity system (see Figure 1) controls the air flow rate of 5 L/min (humidity is 78%) to pass through the humidistat. The lower part of the humidistat is filled with saturated ammonium chloride solution;

c) Penetration meter: in accordance with GB/T 4509; precision is 0.1 mm; the sum of the mass of the standard needle and the needle strip is (50.00±0.05) g;

d) Electrothermal constant temperature drying oven: accuracy is ±2°C;

e) Beaker: capacity is 100 mL;

f) Stopwatch: graduation value is 0.1 s;

g) Vibrating screen machine: swing frequency is 4.58 Hz ~ 4.92 Hz; shock frequency is 0.52 Hz ~ 0.55 Hz; shock height is 4.0 mm.

6.7.2 Test steps

6.7.2.1 In a dry and clean beaker, fill the powder extinguishing agent specimen. Use a spatula to smooth the surface.

6.7.2.2 Place the beaker on the shaker. Use a clamp to clamp. Shake for 5 min. Remove the beaker. Humidify in a humidistat with a temperature of (21±3)°C and a relative humidity of 78% for 24 h. Then move it into an electric constant temperature drying oven with a temperature of (48±3)°C and dry for 24 h.

6.7.2.3 Determination of penetration: When measuring, the tip of the needle shall be close to the surface of the specimen. The distance between the needle penetration points and between the needle penetration point and the beaker wall shall not be less than 10 mm. After the needle falls freely into the specimen for 5s, record the depth of the needle inserted into the specimen. Measure three needle penetration points for each beaker specimen.

6.7.3 Results

Take the average value of 9 test results whose deviation from the average value does

6.9.1 Instruments and equipment

The requirements for the instruments and equipment for the low temperature resistance test are as follows:

a) Low temperature tester: accuracy is ±1°C;

b) Test tube: ϕ20 mm × 150 mm;

c) Balance: resolution is 0.2 g;

d) Stopwatch: division value is 0.1 s.

6.9.2 Test steps

6.9.2.1 Weigh 20 g of powder extinguishing agent specimen, accurate to 0.2 g. Place in a dry, clean test tube.

6.9.2.2 Put the test tube in a -55°C environment for 1 h after stoppering.

6.9.2.3 Remove the test tube. Tilt it upside down within 2 s. Use the stopwatch to record the time for the specimen to flow completely.

6.9.3 Results

Take the average value of 3 test results as the measurement result.

6.10 Electrical insulation

6.10.1 Instruments and equipment

The requirements for the instruments and equipment for electrical insulation testing are as follows:

a) Test cup (see Figure 3): The cup body is made of high insulating material that does not absorb moisture. The distance between any part of the electrode and the test cup is not less than 13 mm. The distance between the top of the test cup and the top of the electrode is not less than 32 mm.

b) Plate electrodes are polished brass plates. The diameter is 25 mm. The thickness is not less than 3 mm. The edges are at right angles. The electrode spacing is (2.50 ± 0.01) mm.

c) Pressure resistance tester: the output voltage can be continuously raised to above 5 kV.

d) Drop test bench: the maximum drop height is 30 mm. The maximum allowable load is 50 kg. It is continuously adjustable in the frequency range of 0 Hz ~ 1.667 Hz. The falling acceleration is greater than 9.3 m/s^2.

Put the powder extinguishing agent specimen in a colorless glass. Observe the color.

6.12 Fire extinguishing performance

The extinguishing performance of powder extinguishing agent for class A fire shall be inspected according to the provisions of Annex C. The extinguishing performance of powder extinguishing agent for classes B, C fire shall be inspected according to the provisions of Annex D.

7 Inspection rules

7.1 Inspection categories and items

7.1.1 Routine inspection

In normal production, each batch of products shall be routinely inspected. Bulk density, fluidity, water repellency, particle size distribution, low temperature resistance, and color are routine inspection items.

7.1.2 Confirmation inspection

All inspection items in Table 1 are confirmation inspection items. Each lot of products shall be sampled for inspection of the content of chemical content, moisture content, moisture absorption rate, and penetration. The rest of the items shall also be inspected regularly to ensure that the products continue to meet the requirements of this Standard.

7.1.3 Type inspection

All the inspection items in Table 1 are type inspection items. In one of the following situations, type inspection shall be carried out:

a) When a new product is identified, or an old product is transferred to a factory for production;

b) After formal production, when the raw materials and process have changed greatly;

c) When the production has been suspended for more than one year, production is resumed;

d) When the national quality supervision agency proposes type inspection requirements according to law.

7.2 Sampling method

7.2.1 Samples for type inspection and confirmation inspection shall be taken from products that pass routine inspection. The sampling method shall ensure that the sampling is representative. The samples shall be thoroughly mixed before testing.

Annex A

(Normative)

Test method for sodium bicarbonate content

A.1 Titration method (arbitration method)

A.1.1 Method principle

After destroying the silicon film of the powder extinguishing agent specimen, heat distilled water to dissolve and filter. Take its filtrate. Use cresyl red-thymol blue and bromocresol green-methyl red as indication solutions respectively. Use standard hydrochloric acid solution to titrate.

A.1.2 Reagents

Test reagents:

a) Acetone: analytically pure;

b) Grade three water: comply with the provisions of GB/T 6682;

c) Bromocresol green ethanol solution (0.1%);

d) Methyl red ethanol solution (0.2%);

e) Bromocresol green-methyl red mixed indicator: Mix bromocresol green ethanol solution (0.1%) with methyl red ethanol solution (0.2%) at a volume ratio of 3:1. Shake well;

f) Cresyl red sodium salt solution (0.1%);

g) Thymol blue sodium salt solution (0.1%);

h) Cresyl red-thymol blue mixed indicator: Mix cresyl red sodium salt solution (0.1%) with thymol blue sodium salt solution (0.1%) at a volume ratio of 1:3. Shake well;

i) Hydrochloric acid standard titration solution: Use hydrochloric acid (in accordance with the provisions of GB/T 622) to prepare an aqueous solution of which the concentration is about 0.1 mol/L.

A.1.3 Instruments

Test instruments:

a) Balance: resolution is 0.2 mg;

b) Volumetric flask: 500 mL;

c) Pipette: 50 mL;

d) Burette: 50 mL;

e) Erlenmeyer flask: 250 mL.

A.1.4 Test steps

A.1.4.1 Prepare the solution to be tested as follows:

a) Weigh 2 g of powder extinguishing agent specimen, accurate to 0.0002 g. Put in a 100 mL beaker. Add 3 mL ~ 4 mL of acetone and keep stirring.

b) After the acetone volatilizes, add a small amount of hot tertiary water at 60℃ ~ 70℃ to dissolve and filter. Use about 250 mL of grade three water to wash the insoluble matters. Collect the filtrate and detergent in a 500 mL volumetric flask. Use grade three water to dilute to 500 mL. Shake well and it shall be solution A to be tested.

A.1.4.2 Use a pipette to draw 50 mL of solution A. Transfer to a 250 mL Erlenmeyer flask. Add 5 drops of cresyl red-thymol blue mixed indicator. Use hydrochloric acid standard solution to titrate until the color of the test solution changes from purple to yellow. Read the volume V_1 of the consumed hydrochloric acid standard solution.

A.1.4.3 Add 10 drops of bromocresol green-methyl red mixed indicator. Use hydrochloric acid standard solution to titrate until the color of the test solution changes from green to dark red.

A.1.4.4 Boil for 2 min. The color of the solution changes back to green. Cool to room temperature. Use hydrochloric acid standard solution to continue titrating till dark red as the end point. Read the volume V_2 of the consumed hydrochloric acid standard solution.

A.1.5 Results

The sodium bicarbonate content x_1 in the specimen is calculated according to formula (A.1):

$$x_1 = \frac{c \times (V_2 - 2 \times V_1) \times 0.840\ 1}{m_0} \times 100\% \quad \cdots\cdots\cdots\cdots\cdots\cdots (A.1)$$

Where,

m_0 - the specimen mass, in grams (g);

Annex B

(Normative)

Test method for ammonium dihydrogen phosphate content

B.1 Method principle

The orthophosphate ion in the ammonium dihydrogen phosphate solution reacts with the quinolybdocitone reagent in an acidic medium to form a yellow quinoline phosphomolybdate precipitate. After filtering, washing and drying, weigh the weight of the obtained precipitate and perform the nitrogen content inspection according to GB/T 535 for correction.

B.2 Reagents

Test reagents:

a) Sodium molybdate: analytically pure;

b) Citric acid: analytically pure;

c) Nitric acid: analytically pure;

d) Grade three water: comply with the provisions of GB/T 6682;

e) Quinoline: no reducing agent;

f) Acetone: analytically pure;

g) Nitric acid solution: 1+1 solution;

h) Preparation of quincimolicone reagent:

1) Prepare solution a: Put 70 g of sodium molybdate in a 400 mL beaker. Add 100 mL of grade three water to dissolve;

2) Preparation solution b: Place 60 g of citric acid in a 1000 mL beaker. After adding 100 mL of grade three water to dissolve, add 85 mL of nitric acid;

3) Prepare solution c: Add solution a to solution b. Mix well;

4) Prepare solution d: In a 400 mL beaker, mix 35 mL of nitric acid with 100 mL of grade three water. Then add 5 mL of quinoline;

5) Add solution d to solution c. Mix well. Stand overnight. Use filter paper or cotton to filter. Add 280 mL of acetone to the filtrate. Use grade three water to

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