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Electronic cigarette

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Electronic cigarette

1 Scope

This document defines terms and definitions for electronic cigarette. It specifies the design and raw material requirements and technical requirements for electronic cigarette. It describes the test methods and provides the marks and product manual.

This document applies to electronic cigarette and electronic cigarette module.

This document does not apply to other tobacco products.

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 1540, *Paper and board - Determination of water absorption - Cobb method*

GB/T 2423.7-2018, *Environmental testing - Part 2: Test methods - Test Ec: Rough handling shocks, primarily for equipment-type specimens*

GB/T 4208-2017, *Degrees of protection provided by enclosure (IP code)*

GB 4343.1, *Electromagnetic compatibility requirements for household appliances, electric tools and similar apparatus - Part 1: Emission*

GB 4706.1, *Household and similar electrical appliances - Safety - Part 1: General requirements*

GB 4806.1, *National Food Safety Standard - General Safety Requirements on Food Contact Materials and Articles*

GB 4806.3, *National Food Safety Standard - Enamelware*

GB 4806.4, *National Food Safety Standard - Ceramic Ware*

GB 4806.5, *National Food Safety Standard - Glass Products*

GB 4806.6, *National Food Safety Standard - Plastic resin used in food-contact*

GB 4806.7, *National Food Safety Standard - Food Contact Used Plastic Materials and Products*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 electronic cigarette

An electron delivery system used to generate aerosols for human inhalation.

NOTE: Cigarettes are not included.

3.2 e-atomization material

Mixtures and auxiliary substances that can be fully or partially atomized by electronic devices into inhalable aerosols.

3.3 e-liquid

E-atomization material in liquid form.

3.4 electronic cigarette device

An electronic device that aerosolizes e-atomization material into inhalable aerosol.

3.5 electronic cigarette module

A component or combination of components that constitutes an independent part of an electronic cigarette.

NOTE: It includes any product that is sold separately and can form an independent part of an electronic cigarette.

3.6 cartridge

An electronic cigarette module that contains e-atomization material.

3.7 atomization agent

Substances in e-atomization material that can be atomized into the main components of aerosols.

NOTE: Typically, it is propylene glycol, glycerin and water.

3.8 additive in e-atomization material

Substances added to e-atomization material for functional needs such as improving quality and preventing deterioration.

3.9 electronic cigarette material

Materials other than e-atomization material used in the manufacture of electronic cigarettes.

3.10 electronic cigarette emissions

Aerosols produced by smoking electronic cigarettes.

3.11 emission amount

The amount of a certain substance or a certain type of substance in electronic cigarette emissions under standard smoking conditions.

4 Design and raw material requirements

4.1 Design requirements

4.1.1 Electronic cigarette device

4.1.1.1 The general safety design of electronic cigarette device shall meet the requirements of GB 4706.1.

4.1.1.2 The design of electromagnetic compatibility performance for electronic cigarette device shall meet the requirements of GB 4343.1.

4.1.2 Electronic cigarette material

4.1.2.1 The selection of materials that come into contact with the oral cavity, e-atomization material, and electronic cigarette emissions shall meet the requirements of GB 4806.1, GB 4806.3 ~ GB 4806.11.

4.1.2.2 The selection of materials that are not in contact with oral cavity, e-atomization material, and electronic cigarette emissions shall meet the limit requirements of GB/T 26572 for restricted substances in homogeneous materials.

4.1.3 E-atomization material

4.1.3.1 It shall not be inducing to juveniles. The characteristic flavor of the product shall not present flavors other than tobacco.

4.1.3.2 E-atomization material shall contain nicotine.

4.1.3.3 The selection of additive in e-atomization material shall meet the following principles:

- a) It shall not increase health risk under normal and foreseeable conditions of use.
- b) It shall be technically necessary to use.

- a) The additives and the maximum amount allowed to be used in the e-atomization material are implemented in accordance with Annex A.
- b) The use of other additives shall be evaluated for their toxicological properties and use safety risks. It is confirmed that it will not increase the health risks of users. The content of the evaluation includes but is not limited to food safety, inhalation safety, and safety under the conditions of electronic cigarette use.
- c) Additives that are regulated by the national food safety standards shall comply with the stipulations. If there is no national food safety standard, the enterprise shall make corresponding regulations on the requirements for purity, impurities and pollutants.
- d) Attention shall be paid to changes in the safety risk information of substances used. Timely adjustments shall be made.

5 Technical requirements

5.1 Electronic cigarette device

5.1.1 Anti-filling

The electronic cigarette device and cartridge shall have a closed structure that prevents artificial filling.

5.1.2 Leakproof fluid

The electronic cigarette device and cartridge using e-liquid shall have good airtightness. There shall be no leakage.

5.1.3 Startup protection

The electronic cigarette device shall have a child-resistant activation function and a protection function against accidental activation.

5.1.4 Atomization area temperature

It shall not be higher than 350°C.

5.1.5 Waterproof

It shall meet the IPX4 protection level requirements in Chapter 6 of GB/T 4208-2017.

5.1.6 Pressure relief safety

When the internal pressure of the electronic cigarette device is caused by battery failure, the pressure relief direction shall not be the same as the suction direction.

6 Test methods

6.1 Electronic cigarette device

6.1.1 Anti-filling

For electronic cigarettes or cartridges filled with aerosols, visually inspect to determine whether additional substances can be added.

6.1.2 Leakproof fluid

For electronic cigarettes or cartridges filled with e-liquid, place them on absorbent paper that meets the requirements of GB/T 1540 for at least 6h in the most unfavorable direction possible. Visually inspect whether there are traces of e-liquid on the absorbent paper.

6.1.3 Startup protection

Check according to the information contained in the product manual. Confirm whether there is a startup protection function and its effectiveness.

6.1.4 Atomization area temperature

In accordance with the provisions of Annex B.

6.1.5 Waterproof

Follow the provisions of 14.2.4 in GB/T 4208-2017. Visually inspect to determine whether there is fire or explosion.

Completely discharge the electronic cigarette after the waterproof test. Recharge to full charge. Visually inspect to determine whether there is fire or explosion.

6.1.6 Pressure relief safety

Overcharge a fully charged battery in an electronic cigarette device assembled for use. Overvoltage increases in steps of 0.1V. Keep each step for 5min until $n \times 6.0V$. Visually inspect to determine if pressure relief has occurred. If a pressure relief occurs, visually determine whether the pressure relief direction is the same as the suction direction.

NOTE: n is the amount of series of batteries or battery parallel blocks.

6.1.7 Falling strength

The electronic cigarette is assembled in a ready-to-use state. The battery shall be fully charged. Carry out the free drop test according to the provisions of 5.2 in GB/T 2423.7-2018. The height is 1.5m. The direction is 1 time for each of the two end faces vertically

of mass fraction, the lowest being 0.1%;

- b) The concentration of nicotine and the total amount of nicotine in the e-atomization material are expressed in "mg/g" and "mg" respectively;
- c) The volume of e-liquid or the mass of solid e-atomization material, expressed in "mL" or "g" respectively;
- d) The restricted use mark of hazardous substances in electrical and electronic products shall comply with the provisions on marking for the restriction of the use of hazardous substances in SJ/T 11364;
- e) Health warnings shall comply with relevant national regulations.

7.1.2 Electronic cigarette module products shall indicate but not limited to the following:

- a) Match the name, model and matching requirements of the module.
- b) If it contains electronic cigarette device parts, the information listed in 7.1.1d) and 7.1.1e) shall be marked.
- c) If it contains e-atomization material, the information listed in 7.1.1a), 7.1.1b), 7.1.1c) and 7.1.1e) shall be marked.

7.1.3 If the product mark cannot be marked on the product due to the limitation of volume, shape, surface material or function, it shall be marked on the sales package.

7.2 Product manual

7.2.1 The product manual of electronic cigarette shall indicate:

- a) Precautions and contraindications during installation, operation and use, emergency treatment measures;
- b) Product installation, operation and use instructions, including startup protection instructions, with diagrams if necessary;
- c) Product performance and technical indicators;
- d) Product cleaning, care and maintenance methods and after-sales service information;
- e) A list of components of the e-atomization material, arranged in descending order of mass fraction, the lowest being 0.1%;
- f) The concentration of nicotine and the total amount of nicotine in the e-atomization material are expressed in "mg/g" and "mg" respectively;

Annex B

(normative)

Test method for atomization area temperature

B.1 Principle

The surface temperature of the heating element of the electronic cigarette device is measured by the thermocouple method.

B.2 Instruments and equipment

B.2.1 Thermocouple

Thermocouple tolerances shall be level 1.

B.2.2 Data collector

The sampling frequency of temperature shall not be lower than 10Hz.

B.3 Test conditions

The test shall be carried out in a place without forced convection air and with an ambient temperature of $(20\pm 5)^{\circ}\text{C}$.

B.4 Test steps

B.4.1 Sample preparation

For the electronic cigarette device using e-liquid, the e-liquid shall be removed as much as possible before the thermocouple is arranged OR the electronic cigarette device or cartridge that is not filled with e-liquid shall be used.

For the electronic cigarette device using solid e-atomization material, solid e-atomization material shall not be loaded.

Remove the shell of the electronic cigarette device or cartridge and the protective parts near the heating element, so as to facilitate the placement of the thermocouple.

Use high temperature resistant glue to bond the thermocouple to the highest temperature position of the heating element. Auxiliary methods can be used to find the location with the highest temperature, such as infrared equipment.

After the thermocouple is placed, the electronic cigarette device or cartridge shall be restored as much as possible. Keep all functions normal.

Annex C

(normative)

Determination of 2,3-butanedione in e-atomization material

C.1 Principle

Use 2,4-dinitrophenylhydrazine (DNPH) solution to perform derivatization reaction with 2,3-butanedione in e-atomization material. Use high performance liquid chromatography to determine the content of derivative compounds.

C.2 Instruments and equipment

C.2.1 Analytical balance: the sensitivity is 0.1mg.

C.2.2 High performance liquid chromatography: equipped with ultraviolet or diode array detector.

C.2.3 Vortex shaker.

C.3 Reagents and materials

C.3.1 Water: GB/T 6682, grade one.

C.3.2 Acetonitrile: chromatographically pure.

C.3.3 Phosphoric acid: the mass fraction is not less than 85%.

C.3.4 Pyridine: the purity is not less than 99%.

C.3.5 Tetrahydrofuran: chromatographically pure.

C.3.6 Isopropanol: chromatographically pure.

C.3.7 2,4-Dinitrophenylhydrazine hydrochloride (DNPH-HCl): the purity is not less than 98%.

C.3.8 2,3-butanedione: the purity is not less than 98%.

C.3.9 Phosphoric acid aqueous solution.

Measure 60mL of phosphoric acid (C.3.3) in a 1L beaker. Slowly add 440mL of water with stirring (C.3.1). Mix well. Store in a reagent bottle. It is valid for 3 months.

C.3.10 Derivatization reagents.

Weigh 1.00g of DNPH-HCl (C.3.7) in a 2L beaker. Add 500mL of acetonitrile (C.3.2) and 40mL of aqueous phosphoric acid (C.3.9). After they are dissolved, add 500mL of water (C.3.1). Mix well. Transfer the solution to a brown reagent bottle and store it away from light. It is valid for 1 week.

C.3.11 Standard solution.

C.3.11.1 2,3-butanedione solution.

Weigh 0.10g of 2,3-butanedione (C.3.8) into a 10mL brown volumetric flask, accurate to 0.1mg. Use acetonitrile (C.3.2) to dissolve. Set the volume constant to the scale. Store at -18°C away from light. It is valid for 3 months.

C.3.11.2 Standard stock solutions of DNPH derivative compounds.

Pipette 0.1mL of 2,3-butanedione solution (C.3.11.1) into a 25mL brown volumetric flask. Add 20mL of derivatization reagent (C.3.10). Shake well. React at room temperature for 20min. Add 1mL of pyridine (C.3.4). Use acetonitrile (C.3.2) to set volume constant to the scale. Store at -18°C away from light. It is valid for 3 months.

C.3.11.3 Standard working solution.

Use acetonitrile to dilute the DNPH derivative compound standard stock solution (C.3.11.2) step by step. Prepare at least 5 standard working solutions. The mass concentration range shall be 0.1µg/mL~4µg/mL. It shall be prepared before use.

C.3.12 Polytetrafluoroethylene (PTFE) filter membrane: 0.45µm.

C.4 Analysis steps

C.4.1 Sample pretreatment

C.4.1.1 E-liquid

Weigh 0.50g of sample into a 10mL brown volumetric flask, accurate to 0.1mg. Add 5mL of derivatization reagent (C.3.10). Shake well. React at room temperature for 20min. Add 0.25mL of pyridine (C.3.4). Use acetonitrile (C.3.2) to set volume constant to the scale. Shake well. Use a PTFE filter membrane (C.3.12) to filter in a brown chromatographic bottle for testing.

C.4.1.2 Solid e-atomization material

Weigh 0.50g of sample into a 15mL centrifuge tube, accurate to 0.1mg. Add 10mL of derivatization reagent (C.3.10). Avoid light and vortex for 20min. Use a PTFE filter membrane (C.3.12) to filter. Pipette 5mL of filtrate into a 10mL brown volumetric flask. Add 0.25mL of pyridine (C.3.4). Use acetonitrile (C.3.2) to set volume constant to the scale. Use a PTFE filter membrane (C.3.12) to filter in a brown chromatographic bottle for testing.

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