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Hygienic requirements for ozone disinfector

臭氧消毒器卫生要求

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Hygienic requirements for ozone disinfector

1 Scope

This standard specifies the raw material requirements, technical requirements, application scope, use methods, inspection methods, transportation and storage, nameplates and instruction manual for use of ozone disinfectors.

This standard applies to ozone disinfectors that generate ozone through dielectric barrier discharge, ultraviolet radiation, electrolysis.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) are applicable to this standard.

GB 5749 Standards for drinking water quality

GB/T 5750.10 Standard examination methods for drinking Water - Disinfection by-products parameters

GB/T 15436 Ambient air - Determination of nitrogen oxides - Saltzman method

GB 17988 Safety and sanitation requirements for disinfecting tableware cabinet

GB/T 18202 Hygienic standard for ozone in indoor air

GB 18466 Discharge standard of water pollutants for medical organization

GB/T 19258 UV germicidal lamp

GB 28235 Safety and sanitary standard for ultraviolet appliance of air disinfection

GB 30689 Hygienic requirements for washer-disinfectors employing chemical disinfection for thermolabile endoscopes

GB/T 38497 Evaluation method of endoscopic disinfection effect

GBZ 2.1 Occupational exposure limits for hazardous agents in the workplace Part 1: Chemical hazardous agents

at the inlet end of the ozone generator.

4.1.1.3 Cooling system

4.1.1.3.1 When air is used as the cooling method of the ozone generator, the relative humidity of the cooling air shall be ≤ 85%.

4.1.1.3.2 When water is used as the cooling method of the ozone generator, the cooling water that directly cools the ozone generator is 6.5 ≤ pH ≤ 8.5, chloride content ≤ 250 mg/L, total hardness (calculated as $CaCO_3$) ≤ 450 mg/L, turbidity (scattering turbidity unit) ≤ 1 NTU.

4.1.2 Ultraviolet radiation type

4.1.2.1 The ultraviolet lamp tube shall be made of quartz glass or raw materials with equivalent ultraviolet transmittance.

4.1.2.2 The initial ozone output rate of the ozone ultraviolet germicidal lamp shall not be less than 80% of the indicated value, in line with the requirements of GB/T 19258.

4.1.3 Electrolysis type

4.1.3.1 The material of the electrolytic reaction tank shall be selected from ozone-resistant polymer or metal materials; the membrane electrode material shall be selected from proton exchange membranes and precious metals and their alloys.

4.1.3.2 The gas supply source shall use deionized water with conductivity ≤ 5 μS/cm.

4.2 Ozone disinfector components

The parts contacting ozone shall use ozone-resistant materials, to ensure long-term stable operation in an ozone environment.

4.3 Ozone-water mixing device

4.3.1 Ozone-water mixing elements with low energy consumption and high dissolved gas efficiency shall be used; the dissolved gas efficiency shall be ≥ 50%.

4.3.2 A ozone-water separation device shall be installed to separate undissolved gaseous ozone; an ozone tail gas decomposition device shall be installed to decompose the separated ozone gas.

4.4 Monitoring device

5.1.3 By-products

5.1.3.1 With air as the gas source, the concentration of nitrogen oxides (NO_x) produced by the ozone disinfector shall not be greater than 2.5% of the ozone concentration.

5.1.3.2 When used for drinking water disinfection, the bromate concentration in the water shall be ≤ 0.01 mg/L; the formaldehyde concentration shall be ≤ 0.9 mg/L.

5.1.4 Ozone leakage

The ozone disinfector is used under human conditions; it shall be airtight when using the ozone gas for sterilization. The ozone leakage in the surrounding environment shall be ≤ 0.1 mg/m^3.

5.1.5 Residual ozone

After one working cycle of ozone disinfection under airtight conditions, the residual amount of ozone gas in the airtight room shall be ≤ 0.16 mg/m^3.

5.2 Ultraviolet radiation type ozone disinfector

5.2.1 Basic working conditions

Under the conditions of ambient temperature 5 °C ~ 45 °C, relative humidity ≤ 85%, power supply voltage 220 V ± 22 V, power supply frequency 50 Hz ± 1 Hz, the ozone disinfector shall be able to be used continuously.

5.2.2 Performance requirements

5.2.2.1 The ozone gas concentration of the ozone disinfector shall be ≥ 60 mg/m^3.

5.2.2.2 After turning on for 5 minutes, the ultraviolet lamp's radiation illuminance shall be stable under normal working conditions; the fluctuation range shall not exceed 5% of the average value.

5.2.2.3 The effective life of the new UV lamp shall be ≥ 1000 h.

5.2.3 Leakage

5.2.3.1 UV leakage

At 30 cm away from the periphery of the disinfector, the UV leakage shall be ≤ 5 μW/cm^2.

5.2.3.2 Ozone leakage

6 Application scope

It is suitable for disinfection of air, water, tableware, food processing pipelines, medical equipment, medical supplies and surface of objects.

7 Method of use

7.1 Air disinfection

7.1.1 According to the volume of the space to be disinfected and the applicable volume requirements in the product's instruction manual, select the applicable ozone air disinfector model.

7.1.2 Air disinfection shall be carried out in a closed space and indoors without people. Generally, the ozone concentration is 5 mg/m^3 ~ 30 mg/m^3, the relative humidity is ≥ 70%, the action time is 30 min ~ 120 min.

7.1.3 When performing air disinfection, the doors and windows shall be closed; the power is turned on; the indicator light is on; the switch or remote control is pressed; the disinfection time is set; the disinfector starts to work. After a disinfection cycle according to the set procedure, the disinfection treatment is completed.

7.2 Water disinfection

7.2.1 It can be used for disinfection of drinking water, water for diagnosis and treatment in medical institutions (non-injection water), sewage, swimming pool water, central air conditioning cooling water, condensate water in public places.

7.2.2 According to the type of water to be disinfected, select the corresponding specifications of ozone water disinfector models according to relevant standards. Install and operate the ozone water disinfector in accordance with the requirements of the instruction manual.

7.2.3 When used for disinfection of drinking water, the exposure time of ozone and water before the water leaves the factory shall be ≥ 12 min; the residual ozone in the water after disinfection shall be ≤ 0.3 mg/L; the residual ozone in the water at the end of the pipe network shall be ≥ 0.02 mg/L .

7.2.4 For the disinfection of water for diagnosis and treatment (non-injection water) in medical institutions, the general ozone input amount is 0.5 mg/L ~ 1.5 mg/L, the remaining ozone concentration in the water is maintained at 0.1 mg/L ~ 0.5 mg/L for 5 min ~ 10 min. For poor water quality or serious pollution, the ozone input is 3 mg/L ~ 6 mg/L.

7.4.1.3 When using ozone water to sterilize medical equipment and supplies, install an ozone water disinfector in accordance with the instruction manual. When disinfecting, put the medical equipment and supplies that need to be disinfected after washing into the container; turn on the power; soak in ozone water or continue to rinse and disinfect for a specified time to complete the disinfection. During disinfection, the ozone concentration in the water shall be ≥ 10 mg/L; the disinfection time shall be ≥ 40 min.

7.4.2 Disinfection of bed unit

7.4.2.1 According to the instruction manual of bed unit and its supplies to be disinfected, select the applicable ozone bed unit disinfector (machine) model.

7.4.2.2 When using, take out the sterilization sealed bag equipped with the bed unit disinfector, put the items to be sterilized into the bag; seal the bag opening; insert the air pipe on the disinfector into the air nozzle of the sealed bag; turn on the power; turn on the power switch; start the disinfection button, the disinfector starts to work (the sealed bag needs to be vacuumed before disinfection) until the disinfection process is all over. During disinfection, the ozone concentration in the sealed bag is generally ≥ 200 mg/L; the relative humidity is ≥ 70%; the maintenance time is ≥ 30 min.

7.4.3 Endoscope disinfection

7.4.3.1 According to the instruction manual of the type of endoscope to be sterilized, select the applicable ozone automatic endoscope disinfector (machine) model.

7.4.3.2 When disinfecting the endoscope, first clean the used endoscope by hand; then put it into the machine tank according to the natural bending state of the endoscope; connect the air and water supply pipes; cover the inner cover of the decontamination tank; meanwhile close the cover of the basin. Turn on the power; turn on the power switch; select the disinfection program and time according to the type of endoscope; start the disinfection button, the disinfector will start working until the disinfection process is all over and the disinfection treatment is completed. When disinfecting, it is generally required that the ozone concentration in the water shall be ≥ 11 mg/L.

7.5 Surface disinfection of object

7.5.1 According to the size of the surface area of the object to be disinfected and the requirements of the product instruction manual, select the applicable ozone surface disinfector model.

7.5.2 When using ozone gas to disinfect the surface of an object, it shall close the doors and windows; turn on the power, the indicator light is on; press the switch or remote control; set the disinfection time, the disinfector starts to work.

8.2.1 Performance requirements

8.2.1.1 Ozone concentration of ozone disinfector

It is determined according to the method specified in Appendix A.

8.2.1.2 Ultraviolet radiation illuminance and its fluctuation range

8.2.1.2.1 Ultraviolet radiation illuminance

It is determined according to the method specified in GB 28235.

8.2.1.2.2 Illumination fluctuation range of ultraviolet radiation

When starting up for 5 min, 10 min, 15 min, 30 min, 60 min, 120 min, the irradiance of the ultraviolet germicidal lamp is measured respectively, to calculate the average value and its fluctuation range.

8.2.1.2.3 Effective life of UV germicidal lamp

It is determined according to the method specified in GB 28235.

8.2.2 Leakage

8.2.2.1 UV leakage

After turning on the ozone disinfector for 5 minutes to stabilize, at a distance of 30 cm from the outer surface of the disinfector, use an ultraviolet radiation illuminance meter to detect the ultraviolet radiation illuminance.

8.2.2.2 Ozone leakage

It is determined according to the method specified in GB/T 18202.

8.2.3 Residual ozone

It is determined according to the method of 8.1.4.

8.3 Electrolysis type ozone disinfector

8.3.1 Performance requirements

8.3.1.1 Ozone concentration of ozone disinfector

It is determined according to the method specified in Appendix A.

8.3.1.2 Power consumption of ozone disinfector

It is determined according to the method specified in Appendix C.

Appendix A

(Normative)

Ozone concentration determination method

A.1 Iodometry

A.1.1 Purpose

The chemical method is used in the laboratory to accurately determine the concentration of ozone gas or ozone contained in ozone water produced by the ozone disinfector.

A.1.2 Test equipment

A.1.2.1 Pipette (1 mL, 5 mL, 10 mL, 25 mL).

A.1.2.2 Burette (2 mL, 5 mL, 10 mL, 25 mL, 50 mL).

A.1.2.3 Iodine measuring flask (100 mL, 250 mL).

A.1.2.4 Volumetric flasks (50 mL, 100 mL, 250 mL, 500 mL, 1000 mL).

A.1.2.5 Conical flask (100 mL, 250 mL, 500 mL).

A.1.2.6 Balance (0.1 mg).

A.1.2.7 Atmospheric sampler.

A.1.2.8 Other equipment.

A.1.3 Reagents

A.1.3.1 Prepare 3 mol/L sulfuric acid, 200 g/L potassium iodide and 5 g/L starch solutions.

A.1.3.2 Prepare and calibrate 0.05 mol/L sodium thiosulfate titrant.

A.1.4 Test method

A.1.4.1 Sampling: When detecting the concentration of ozone aqueous solution, precision take a sample of 100.0 mL ~ 300.0 mL (when the concentration is low, but not less than 10 mg/L, take 400.0 mL). Place it in a 500 mL conical flask with stopper. Add 20 mL of 200 g/L potassium iodide solution and mix well. Then add 5 mL of 3 mol/L sulfuric acid. Add the stopper. Let it stand for 5 min.

Note: When sampling involves water flow, the water flow is set in accordance

Where:

I - The light intensity after the beam penetrates the ozone;

I_o - Intensity of incident light without ozone;

K - The absorption coefficient of ozone to light wavelength;

L - The length of the optical path of the ozone sample cell;

C - Ozone concentration.

According to this formula, under the condition of known K and L values, the ozone concentration can be measured by determining the I/I_0 value.

A.2.1.2 Determination

According to the application, it is divided into two types: detecting air ozone and detecting water-soluble ozone. Follow the instruction manual of the instrument. Before using the instrument, it can be used only after it has been certified by a national authorized measurement unit.

A.2.2 Electrochemical method

A.2.2.1 Principle

The ozone in water produces electrochemical reduction on the electrochemical surface: $O_3 + H_2O + 2e^- \rightarrow O_2 + 2OH^-$

The current characteristic curve in the electrochemical circuit is proportional to the concentration of molecular ozone in the solution.

The electrochemical detector is mainly used for on-line continuous detection and control of water-soluble ozone concentration.

A.2.2.2 Operation

The widely used "membrane electrode" dissolved ozone detector can be used. Before using the instrument, it can be used only after it has been certified by a national authorized measurement unit.

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