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Trichloroethylene for industrial use

工业用三氯乙烯

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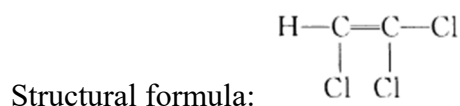
Trichloroethylene for industrial use

1 Scope

This Standard specifies the classification, requirements, test methods, inspection rules and marks, packaging, transportation, storage and safety of trichloroethylene for industrial use.

This Standard is applicable to trichloroethylene for industrial use that is made from dehydrochlorination of tetrachloroethane.

Molecular formula: C_2HCl_3 .



Relative molecular mass: 131.39 (according to the 2007 international relative atomic mass).

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 190, *Packing symbol of dangerous goods*

GB/T 191, *Packaging - Pictorial marking for handling of goods*

GB/T 601, *Chemical reagent - Preparations of reference titration solutions*

GB/T 603, *Chemical reagent - Preparations of reagent solutions for use in test methods*

GB 700, *Carbon structural steels*

GB/T 3143, *Color determination method of liquid chemicals (Hazen unit - Platinum-cobalt scale)*

GB/T 4472-2011, *Determination of density and relative density for chemical products*

GB/T 6283, *Chemical products - Determination of water Karl-Fischer method*

(general method)

GB/T 6324.2, *Test method of organic chemical products - Part 2: Determination of dry residue after evaporation on a water bath for volatile organic liquids*

GB/T 6678, *General principles for sampling chemical products*

GB/T 6680, *General rules for sampling liquid chemical products*

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

GB/T 8170, *Rules of rounding off for numerical values and expression and judgement of limiting values*

GB/T 9722, *Chemical reagent - General rules for the gas chromatography*

3 Classification

Trichloroethylene is classified into type I and type II products according to different use. Type I products are mainly used as chemical production raw materials, Type II products are mainly used for industrial cleaning.

4 Requirements

4.1 Appearance

Transparent liquid, no visible impurities.

4.2 Trichloroethylene for industrial use shall meet the technical requirements shown in Table 1.

Table 1 - Technical requirements

and prepare.

5.7.2.2 Hydrochloric acid standard titration solution: $c(\text{HCl}) = 0.01 \text{ mol/L}$.

When it is required, use 0.1 mol/L hydrochloric acid standard titration solution to dilute and prepare.

5.7.2.3 Bromothymol blue indicator solution: 1 g/L .

5.7.2.4 Water.

Use 0.01 mol/L sodium hydroxide standard titration solution or 0.01 mol/L hydrochloric acid standard titration solution to adjust the pH value as $6.6 \sim 7.0$.

5.7.3 Instruments

5.7.3.1 Micro-burette: 10 mL . The division value is 0.01 mL .

5.7.3.2 Laboratory routine analytical instruments.

5.7.4 Analysis steps

Use measuring cylinders to respectively measure 50 mL of specimen and 100 mL of water. Place in a separating funnel. Violently oscillate 3 min (about 200 times). After static layering, use a transfer pipette to pipette 50 mL of water phase into a triangular flask. Add $5 \sim 6$ drops of bromothymol blue indicator solution. If the solution is yellow, the solution shall be acidic. If the solution is blue, the solution shall be alkaline. If the solution is green, the solution shall be neutral.

When the solution is acidic: Use sodium hydroxide standard titration solution (5.7.2.1) to titrate till the color turns light blue, which shall be the end point.

When the solution is alkaline: Use hydrochloric acid standard titration solution (5.7.2.2) to titrate till the color turns yellow, which shall be the end point.

When the solution is neutral: Process the solution as acidic.

5.7.5 Result calculation

The mass fraction w_1 of acidity (as HCl) or alkalinity (as NaOH) is calculated according to formula (2):

$$w_1 = \frac{c \times V_1 \times M}{V_2 \times \rho_1 \times 500} \times 100 \% \quad \dots\dots\dots (2)$$

Where,

V_1 - The volume of sodium hydroxide (5.7.2.1) or hydrochloric acid (5.7.2.2) standard

titration solution consumed by test material, in milliliters (mL);

c - The accurate value of sodium hydroxide or hydrochloric acid standard titration solution concentration, in moles per liter (mol/L);

V_2 - The volume of test material, in milliliters (mL);

ρ_t - The specimen density, in grams per liter (g/mL);

M - The molar mass of sodium hydroxide or hydrochloric acid, in grams per mole (g/mol) [$M(\text{NaOH})=40.00$, $N(\text{HCl})=36.46$].

Take the arithmetic mean of two parallel determinations as the report result. The absolute difference of two parallel determinations is not greater than 0.0005%.

5.8 Determination of moisture

5.8.1 Karl Fischer Coulomb Method of Electricity (arbitration method)

5.8.1.1 Reagents

Coulombic coulometric method Karl Fischer reagent (commercially available).

5.8.1.2 Instruments

5.8.1.2.1 Coulomb coulometric moisture analyzer: The accuracy is $0.1\mu\text{g H}_2\text{O}$. The measuring range is $10\mu\text{g}\sim 100\text{mg H}_2\text{O}$.

5.8.1.2.2 Balance: The accuracy is 0.01g.

5.8.1.2.3 Air tightness syringe: 1mL.

5.8.1.3 Analysis steps

Use a clean and dry 1mL air tightness syringe to take 1mL of specimen. Weigh it on the balance, to the nearest of 0.01g. Immediately inject the specimen into the Coulometric Karl Fischer moisture analyzer. Weigh the injector again, to the nearest of 0.01g. Obtain the accurate mass of the injected specimen. Carry out the coulometric titration according to the instrument requirements. Read the water mass from the instrument. Calculate the moisture content or directly read the moisture content from the instrument.

5.8.2 Karl Fischer Volumetric Method

Carry out according to GB/T 6283.

5.8.3 Tolerance

Take the arithmetic mean of two parallel determinations as the report result. The absolute difference of two parallel determinations is not greater than 0.002%.

5.9 Determination of free chlorine

5.9.1 Method summary

In the acidic medium, free chlorine reacts with potassium iodide to generate free iodine. When iodine meets starch, it turns blue. The presence or absence of free chlorine is determined by the presence or absence of blue coloration.

5.9.2 Reagents

5.9.2.1 Potassium iodide solution: 100g/L.

5.9.2.2 Acetic acid solution: 1+1.

5.9.2.3 Starch solution: 5g/L.

5.9.3 Analysis steps

Use a transfer pipette to pipette 20mL of specimen into a colorimetric tube. Add 50mL of water. Violently oscillate 3min (about 200 times). After static layering, use a transfer pipette to pipette 20mL of water phase into another colorimetric tube. Add 0.1mL of potassium iodide solution, 1mL of acetic acid solution, 0.1mL of starch solution in sequence. Shake till they are even. Place it still for 5min from light. Observe if blue color appears. It shall be accepted if there is no blue color.

5.10 Determination of acidity after accelerated oxidation test

5.10.1 Method summary

Put steel sheet into the specimen. Access with water and oxygen. Make oxygen saturate. At the same time, use a light bulb to heat and reflux for 48h. Quantitatively pipette the water phase. Use sodium hydroxide standard titration solution to titrate.

5.10.2 Reagents

Oxygen: Volume fraction $\geq 99.9\%$.

5.10.3 Instruments

5.10.3.1 Ground triangle bottle: 500mL.

5.10.3.2 Ground straight tube condenser: The length is 500mm.

5.10.3.3 Incandescent lamp: 220V, 150W.

5.10.3.4 Stainless steel lampshade: $\Phi 178\text{mm} \times 190\text{mm} \times 1\text{mm}$.

5.10.3.5 Stainless steel support plate: $\Phi 195\text{mm} \times 6\text{mm}$, middle hole $\Phi 83\text{mm}$.

Weigh 200mL of specimen into a 500mL ground triangle bottle. Put sheet A into it. Cover the end of the oxygen tube with the blow mold tube and insert it into the ground straight tube condenser, 6mm from the bottle bottom. Steel sheet B is tied under the oxygen inlet pipe with Teflon tape (as Figure 1). Then respectively access water and oxygen to the ground triangle bottle. Use the bulb to heat. Adjust the oxygen flow as 10~12 air bubbles per minute. Adjust the water flow to make the sample condensate and reflux at the height below half of the ground tube condenser. Heat and reflux continuously for 48h. Cool to room temperature. Completely shake the solution in the ground triangle bottle. Place it still for static layering. Determine according to 5.7.4.

6 Inspection rules

6.1 Type inspection and exit-factory inspection are adopted in this Standard.

6.1.1 All items required in Chapter 3 are type inspection items. In normal case, type inspection shall be carried out once every month. Type inspection shall be conducted in one of the following cases:

- a) When the key production process is updated; the main raw materials are changed;
- b) When the production is stopped and resumed;
- c) When a major quality accident happens;
- d) When the exit-factory inspection results are quite different from the previous type inspection results;
- e) When the quality supervision agency makes requirements in accordance with the law.

6.1.2 The chromaticity, density, trichloroethylene content, 1,1,2-trichloroethane content, tetrachloroethylene content, alkalinity and acidity as well as moisture of technical indicators in Table 1 are exit-factory inspection items.

6.2 Trichloroethylene for industrial use is inspected by the quality supervision and inspection department of the manufacturer. The manufacturer shall ensure that each technical indicator of the exit-factory product meets the requirements of this Standard and has the quality certificate in a specified format. The quality certificate shall contain:

- a) Manufacturer's name;
- b) Product name and level;
- c) Production date or batch number;
- d) Product quality inspection results or inspection conclusion;

e) Reference to this Standard.

6.3 The trichloroethylene for industrial use of the same mass shall be a batch. Usually, a storage tank of products is a batch.

6.4 The number of sampling units of trichloroethylene for industrial use is determined according to GB/T 6678. The sampling method is in accordance with GB/T 6680. The sampling size of each batch is not less than 500mL. When sampling and sample mixing, it shall try to avoid contacting with air.

6.5 The judgement of inspection results is carried out according to the rounded value comparison method specified in GB/T 8170. If an indicator in the inspection results fails to meet the requirements in this Standard, the tank stored products shall be double sampled for reinspection. For the small-packed products, resample from twice the number of packaging units for reinspection. Even if an indicator in the reinspection results fails to meet the requirements in this Standard, the whole batch of products shall be rejected.

7 Marks, packaging, transportation, storage

7.1 Marks

On the packaging container for trichloroethylene for industrial use, there shall be a firm and clear mark, indicating:

- a) Product's name;
- b) Manufacturer's name and address;
- c) Product batch number or production date;
- d) Net content;
- e) Reference to this Standard;
- f) Marks of "toxic substances" in GB 190 and "Afraid of the sun" in GB/T 191.

7.2 Packaging

According to the storage, transportation, usage or user's requirements, suitable stabilizer can be added into trichloroethylene for industrial use. When packaging, use clean, dry tank car, tank container or galvanized iron drum, polyvinyl fluoride drum for packaging. Or the conditions that meet the safety requirements, according to user's requirements, use qualified containers for packaging. The packaging container shall be firm and tight. Before using galvanized iron drum or polyvinyl fluoride drum for packaging, it shall use nitrogen to replace the container. The packaging container shall have at least 5% space.

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