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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 33065-2016

**Fluorinated olefins for refrigerant use - General method for the
determination of acidity**

制冷剂用氟代烯烃 酸度的测定通用方法

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1 Scope

China's national standard method for determining acidity in fluorinated olefin refrigerants. It specifies the principle of the method, the sampling, the test method and the tolerance for determining acidity in fluorinated olefins used as refrigerants by acid-base titration, and it applies to fluorinated olefins used in low, medium and high pressure refrigerants, with a detection sensitivity of 0.000005 per cent. The fluorinated olefins are the fourth generation of refrigerants. The chlorofluorocarbons were phased out because they destroyed stratospheric ozone; the hydrochlorofluorocarbons that replaced them were phased out for the same reason more slowly; the hydrofluorocarbons that replaced those solved the ozone problem entirely and turned out to be potent greenhouse gases with atmospheric lifetimes of decades. The fluorinated olefins - the compounds sold as HFO-1234yf and its relatives - carry a carbon-carbon double bond, which is the whole point: it is attacked by hydroxyl radicals in the lower atmosphere, so the molecule breaks down in days rather than decades and its global warming potential is close to that of carbon dioxide. That same double bond is why acidity has to be measured. It is a reactive site, and a fluorinated olefin can hydrolyse or degrade to produce hydrogen fluoride and other acids, which attack the compressor windings, the bearings and the copper of a refrigeration circuit. The method is a titration: the sample is vaporised and bubbled through water to absorb the acidic material, and the absorbate is titrated with sodium hydroxide against bromocresol green, the result being expressed as hydrochloric acid. Issued on 13 October 2016 and in force since 1 May 2017.

This standard specifies the method principles, sampling, test methods, tolerances, etc. of the general test method, for the determination of acidity in fluorinated olefins, which are used in refrigerants, by the acid-base titration. This standard is applicable to the determination of acidity in fluorinated olefins, which are used in low pressure, medium

pressure, high pressure refrigerants. The detection sensitivity of this test method is 0.000005%.

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) is applicable to this standard.

GB/T 601 Chemical reagent - Preparations of standard volumetric solutions

GB/T 603 Chemical reagent - Preparations of reagent solution for use in test method

GB/T 6680-2003 General rules for sampling liquid chemical products

GB/T 6681-2003 General rules for sampling gaseous chemical products

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

3 Principles of the method

The specimen is vaporized and bubbled into a porous gas washing bottle, which is filled with water, to absorb the acidic substance in the sample. Use bromocresol green as an indicator. Use sodium hydroxide standard titration solution for titration. Calculate the acidity (based on HCl).

4.1 Equipment

4.1.1 Steel sampling cylinder: 1000 mL or 500 mL single-valve or double-valve type small steel cylinder. The working pressure shall be greater than the pressure of the same product.

4.1.2 Sampling bottle: 1000 mL or 500 mL mouth-ground glass bottle.

4.1.3 Sampling tube: Copper or iron joints, copper tube (for medium pressure and high pressure), glass tube (for low pressure), etc.

4.2 Operational requirements

4.2.1 Sampling of fluorinated olefins, for medium and high-pressure refrigerants, shall be conducted in accordance with the provisions of

7.10 in GB/T 6681- 2003. The steel sampling cylinder and sampling tube shall be vacuum-dried. The specimen shall enter the sampling cylinder, in liquid phase. The total amount of sampling shall meet the needs of inspection.

4.2.2 Sampling of fluorinated olefins, for low-pressure refrigerants, shall be conducted in accordance with the provisions of

7.1 of GB/T 6680-2003. Sampling bottles and sampling tubes (glass tubes) shall be dried. The total amount of sampling shall meet the needs of inspection.

4.2.3 Affix a label and indicate the following: product name, batch number, sampling date, name of the sampler, etc., which are used for inspection.

5 Test method

Warning: Some test procedures, which are specified in this standard, may lead to dangerous situations. Users shall take appropriate safety and health protection measures.

5.1 General provisions The reagents and water, which are used in the test method, refer to the reagents confirmed to be analytically pure AND the grade-3 water specified in GB/T 6682, unless otherwise specified. The standard solutions, preparations, products, which are used in the test methods, are prepared in accordance with the provisions of GB/T 601 and GB/T 603, unless otherwise specified.