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GB/T 2430-2008

Replacing GB/T 2430-1981

Standard test method for freezing point of aviation fuels

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Standardization Administration of the People's Republic of China.

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Foreword

This Standard modifies and adopts American ASTM D2386:2006 *Standard test methods for freezing point of aviation fuels*.

This Standard is redrafted according to ASTM D2386:2006.

In order to meet the national conditions, this Standard is modified when adopting ASTM D2386:2006. The main difference between this Standard and ASTM D2386:2006 are as follows:

- The normative references used in this Standard adopt the corresponding national standards;

- Add content about pressing cap in instrument and test steps;

- Delete the content about using methanol as coolant in Clause 6.4;

- Delete the content about converting Celsius to Fahrenheit in note 9.

For convenience od use, following editorial changes have been made in this Standard:

- Modify the textual expression of repeatability and reproducibility in accordance with our country's habits.

This Standard replaces GB/T 2430-1981 *Jet fuels - Determination of freezing-point.* GB/T 2430-1981 was developed by referring to ISO 3013:1974 *Standard test method for freezing point of aviation fuels*.

The differences between this Standard and GB/T 2430-198 are as follows:

- Modify the standard name. Name of GB/T 2430-1981 is *Jet fuels - Determination of freezing-point,* while the name of this Standard is *Standard test method for freezing point of aviation fuels*.

- Delete the content about technical conditions of the thermometer in Clause 2.6 of GB/T 2430-1981, and change it to be GB-38 - thermometer in accordance with GB/T 514 *Specification for liquid-in-glass thermometers for testing of petroleum products*.

- Add the sampling content in Chapter 7;

- The expression approach of the size of the double-walled glass tube is somewhat changed; the inner diameter of the inner pipe in this Standard is 18.7mm ± 1.1mm (see Figure 1), while the outer diameter of the inner pipe in GB/T 2430-1981 is 22 mm and the inner diameter of it is 18 mm;

- Add specific requirements for the placement location, the stirring speed, and the liquid

Standard test method for freezing point of aviation fuels

1 Scope

1.1 This Standard specifies the test method for freezing point of jet fuel and aviation piston engine fuel. When the temperature is below the freezing point, solid hydrocarbon crystals will form in aviation fuels.

Note: verification of precision of this Standard does not include aviation piston engine fuel.

1.2 This Standard uses international system [SI] unit.

1.3 The use of this Standard may involve hazardous materials, operations and equipment. This Standard does not make suggestions to all safety problems about it. Before using this Standard, the user is responsible for developing corresponding appropriate safety and protective measures, and clearly defines the applicable scope of the restriction.

2 Normative references

The articles contained in the following documents have become part of this document when they are quoted herein. For the dated documents so quoted, all subsequent modifications (excluding corrigendum) or revisions made thereafter do not apply to this Standard. However, the parties who reach an agreement according to this Standard are encouraged to study whether the latest versions of these documents may be used. For the undated documents so quoted, the latest versions apply to this document.

GB/T 514 Specification for liquid-in-glass thermometers for testing of petroleum products

GB 1787 Aviation piston engine fuels

GB/T 4756 Petroleum liquids - Manual sampling (GB/T 4756-1998, eqv ISO 3170:1988)

GB 6537 No.3 Jet fuel

3 Terms and definitions

Following terms and definitions apply to this Standard.

3.1

Freezing point

Under specified conditions, the aviation fuel forms solid hydrocarbon crystals after cooling; heat the fuel; the minimum temperature when the hydrocarbon crystal disappears is the freezing point of the aviation fuel.

4 Significance and use

4.1 The freezing point of aviation fuel is the lowest temperature to ensure that there is no solid hydrocarbon crystal in fuel. If there is such crystal in the aircraft fuel system, it will obstruct the passing of fuel to the filter. Because the temperature in the aircraft fuel tank usually decreases during the flight, and the decrease range depends on the fight speed, the flight height and the duration of the fight, therefore, the freezing point of the fuel must be forever lower than the minimum operation temperature of the oil tank.

4.2 Freezing point is one of technical indicators in GB 1787, GB 6537 and other product standards.

5 Instruments

5.1 Double-walled glass tube: a container without silver-plated, and it is similar to Dewar flask. The space between the inner-outer tubes is filled with dry atmospheric nitrogen or air. The mouth of the tube is plugged with a stopper that is equipped with thermometer and moisture-proof tube (or pressing cap); the stirrer passes through this moisture-proof tube (see Figure 1).

5.2 Moisture-proof tube: see Figure 2. It is used to prevent the condensation of moisture. It can be pressing cap showed in Figure 3.

5.3 Stirrer: it is a brass bar with diameter of 1.6 mm; its lower end is bended to be three smooth spirals.

Note: the stirrer can be used for mechanical stirring.

5.4 Vacuum flask: vacuum flask without silver-plated; the minimum dimension is shown in Figure 1. it shall be able to store sufficient amount of coolant to make the double-walled glass tube to be immersed into the predetermined depth.

Warning - danger of implosion

5.5 Thermometer: fully-immersed type; the temperature range is -80°C ~ +20°C. It complies with the specification requirements of GB-38 thermometer in GB/T 514.

Note: Accuracy of the thermometer shall be verified according to the verification method of the thermometer. The temperatures at the verification points are 0°C, -40°C, -60°C and -75°C

8.3 In addition to the time in observation, it requires to continuously stir the sample in the entire test period; move the stirrer up-and-down at speed of 1 (time/ s) ~ 1.5 (times / s). And pay attention that the copper ring of the stirrer shall not touch the bottom of the double-walled glass tube when moving it downward, and shall be kept under the liquid surface of the sample when moving upward. In some operation steps, it is allowed to stop stirring instantaneous (see note 1); continue to observe the sample, so as to find the hydrocarbon crystals. Because water exists, when the temperature drops to nearly -10°C, cloud-like objects will appear. When the temperature further drops, cloud-like objects will not increase. Therefore, it is not required to consider such cloud-like objects. When visible crystals appear in the sample, record the temperature when the hydrocarbon crystallization occurs. Remove the double-walled glass tube from coolant; allow the sample to continuously rise its temperature under room temperature; meantime, continue to stir it at speed of 1 (time / s) ~ 1.5 (times / s); continue to observe the sample, until the hydrocarbon crystallization disappears; record the temperature when the hydrocarbon crystallization fully disappears.

Note 1: Because the gas released by the coolant may obstruct the sight, the double-walled glass tube may be moved out from the coolant for easy observation. The removal time of the double-walled glass tube shall not exceed 10 seconds. If the crystal has been formed, record the temperature. Allow to stir the sample at room temperature, and rise its temperature. The temperature shall rise to at least 5°C higher than that when the crystal disappears; then immerse the sample into the coolant to cool again. Remove the sample when its temperature is slightly higher than the recorded temperature; observe the crystallization point.

Note 2: it is recommended to compare the temperature when the crystal appears and that when it disappears. The temperature when the crystal appears shall be lower than that when it disappears. Otherwise, it indicates that the crystallization is not properly observed and identified. The difference between the two temperatures usually shall not be larger than 6°C.

9 Report

Correct the observed freezing point value determined in Chapter 8 in accordance with the corresponding correction value of verification thermometer as cited in Clause 5.5. If the observed freezing point value is between the two corrected temperatures, correct it by using linear interpolation. Report the temperature when the crystallization disappears after correction, accurate to 0.5°C. Take it as the freezing point.

10 Precision and deviation

Judge the reliability of the experimental results in accordance with the following rules (95% confidence level)

10.1 Repeatability (r)

The difference between two experimental results of the sample determined, by the same-

instrument, same-operator, in the same-laboratory, shall not be larger than 1.5°C.

10.2 Reproducibility (R)

The difference between two experimental results of the sample determined, by different-instruments, different-operators, in different-laboratories, shall not be larger than 2.5°C.

10.3 Deviation

Because there is no mixture of hydrocarbon with known freezing point to simulate aviation fuel, therefore, it cannot determine the deviation.

11 Key words

Aviation piston engine fuel: jet fuel; crystallization point; determination; freezing point; low temperature test; manual methods; physical experiment; petroleum products.

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