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(PAJ)

**Crude oil and petroleum products—
Determination of sulfur content
Part 5 : General bomb method**

ICS 75.080

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from Petroleum Association of Japan (PAJ), with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

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JIS K 2541 consists of the following 7 parts with the general title *Crude oil and petroleum products—Determination of sulfur content*.

Part 1 : Wickbold combustion method

Part 2 : Oxidative microcoulometry

Part 3 : Quartz-tube combustion method (Air method)

Part 4 : Energy-dispersive X-ray fluorescence method

Part 5 : General bomb method

Part 6 : Ultraviolet fluorescence method

Part 7 : Wavelength-dispersive X-ray fluorescence method

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Crude oil and petroleum products— Determination of sulfur content Part 5 : General bomb method

1 Scope This Japanese Industrial Standard specifies the method of quantitative determination of sulfur content of not less than 0.10 mass % contained in crude oil and petroleum products by general bomb method.

Remarks 1 For this method, when barium sulfate precipitates, the correct test results sometimes can not be obtained for the sample containing interfering elements that leave residue other than barium sulfate that does not get dissolved in dilute hydrochloric acid.

These interfering elements are iron, aluminium, calcium, silicon, lead, etc. Other interfering materials of acid-insolubility are silica, molybdenum disulfide, asbestos, mica, etc.

- 2 This test method can also measure lubricating oil, however it shall not be applied to some lubricating oils containing significant quantities of interfering elements or used lubricating oils containing worn metal and lead or silicate, etc. caused by contamination.
- 3 When doubts arise in the test results obtained by this test method on crude oil and heavy oil, the test shall be carried out by the quartz-tube combustion method (air method) specified in **JIS K 2541-3**.
- 4 Although dangerous reagents, operations, and test apparatus are sometimes used in this Standard, this Standard does not purport to address all the safety precautions. Therefore, the user of this test method shall establish the precautionary measures for safety and health prior to the test.

Information : The group of standards including this Standard specify the test methods shown in Informative Table 1.

Informative Table 1 Classification of test method

Group of standard	Classification of test method	Kind of oil to be applied (example)	Range of measurement
K 2541-1	Wickbold combustion method	Automobile gasoline, kerosene, light oil	1 mass ppm to 10 000 mass ppm
K 2541-2	Oxidative microcoulometry	Automobile gasoline, kerosene, light oil	1 mass ppm to 1 000 mass ppm
K 2541-3	Quartz-tube combustion method (Air method)	Crude oil, light oil, heavy oil	0.01 mass % min.
	Annex (informative) Quartz-tube combustion method (Oxygen method)		
K 2541-4	Energy-dispersive X-ray fluorescence method	Crude oil, light oil, heavy oil	0.01 mass % to 5 mass %
K 2541-5	General bomb method	Crude oil, heavy oil, lubricating oil	0.1 mass % min.
	Annex (normative) Inductively coupled plasma atomic emission spectrochemical analysis	Lubricating oil	0.05 mass % min.
K 2541-6	Ultraviolet fluorescence method	Automobile gasoline, kerosene, light oil	3 mass ppm to 500 mass ppm
K 2541-7	Wavelength-dispersive X-ray fluorescence method	Automobile gasoline, kerosene, light oil	5 mass ppm to 500 mass ppm

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS H 6201 *Platinum crucibles for chemical analysis*

JIS K 0116 *General rules for atomic emission spectrometry*

JIS K 0557 *Water used for industrial water and wastewater analysis*

JIS K 1101 *Oxygen*

JIS K 1105 *Argon*

JIS K 1107 *High purity nitrogen*

JIS K 2238 *Machine oils*

JIS K 2251 *Crude petroleum and petroleum products—Sampling*

JIS K 2279 *Crude petroleum and petroleum products—Determination and estimation of heat of combustion*

JIS K 2541-3 *Crude oil and petroleum products—Determination of sulfur content Part 3 : Quartz-tube combustion method (Air method)*

JIS K 2839 *Glasswares for testing apparatus of petroleum products*

JIS K 8155 *Barium chloride dihydrate*

- JIS K 8180 *Hydrochloric acid*
JIS K 8550 *Silver nitrate*
JIS K 8624 *Sodium carbonate decahydrate*
JIS K 9003 *Liquid paraffin*
JIS P 3801 *Filter paper (for chemical analysis)*
JIS Q 0034 *General requirements for the competence of reference material producer*
JIS Q 0035 *Certification of reference materials—General and statistical principles*
JIS R 1301 *Porcelain crucibles for chemical analysis*
JIS R 3505 *Volumetric glassware*
JIS R 6252 *Abrasive papers*
JIS Z 8401 *Guide to the rounding of numbers*
JIS Z 8402-6 *Accuracy (trueness and precision) of measurement methods and results—Part 6 : Use in practice of accuracy values*

3 Principle of test For this test method, after a sample dish is put in a cylinder containing sodium carbonate solution, the sample is burnt by forcing in oxygen and the resultant sulfur oxide is made to sulfate. Next, the solution in the cylinder is washed out and precipitate of barium sulfate is produced by adding barium chloride solution to this. The sulfur content in the sample is obtained by filtering, igniting, and weighing out this precipitate.

4 Reagents The reagents shall be as follows:

- a) **Barium chloride solution** (85 g/L), prepared so that 100 g of barium chloride dihydrate specified in **JIS K 8155** is dissolved in water to make total 1 000 mL.
Moreover, this solution is used by filtering with filter paper after being left as it is at room temperature for not less than 12 h.
- b) **Hydrochloric acid**, specified in **JIS K 8180**.
- c) **Oxygen**, specified in **JIS K 1101**.
- d) **Sodium carbonate solution** (50 g/L), prepared so that 135 g of sodium carbonate decahydrate specified in **JIS K 8624** is dissolved in water to make total 1 000 mL.
- e) **Diluent**⁽¹⁾, being the liquid paraffin specified in **JIS K 9003**.
Note ⁽¹⁾ When the sample is difficult to be dissolved in liquid paraffin, other diluent with a small amount of sulfur content is used in place of liquid paraffin.
- f) **Silver nitrate solution** (20 g/L), prepared so that 2 g of silver nitrate specified in **JIS K 8550** is dissolved in water to make total 100 mL, and preserved in a brown bottle.
- g) **Water**, being A3 specified in **JIS K 0557**.