

## Attachment

### Argon

Argon gas

アルゴン

### Standards for use

Not specified

### Compositional specifications

**Substance name** Argon

**Molecular weight** 39.95

**Chemical name [CAS number]** Argon [7440-37-1]

**Definition** Argon is a substance produced using the air liquefaction separation method.

**Content** Argon contains not less than 99.0% (vol) of argon (Ar).

**Description** Argon is a colorless gas having no odor.

#### **Identification**

- (1) When a burning wood chip with a flame is placed in a test tube containing Argon, the flame goes off.
- (2) Introduce Argon into a 1-mL gas measuring tube for gas chromatography, and analyze it by gas chromatography using the operation conditions given in Purity (ii) below. The retention time of the main peak corresponds to that of the main peak obtained when the reagent argon is analyzed in the same manner.

**Purity** Oxygen and Nitrogen Not more than 1.0% (vol) as the total amount.

#### (i) Oxygen

Measure oxygen in Argon using a yellow phosphor luminescent oxygen analyzer and determine the amount (% (vol)). If the amount of oxygen obtained exceeds the measurement range of the meter, exactly dilute the sample gas with oxygen-free nitrogen, and determine the amount.

#### (ii) Nitrogen

Introduce Argon into a 1.0-mL gas measuring tube for gas chromatography at constant flow rate of 50–150 mL/min, analyze it using the operating conditions below, and obtain the peak area ( $A_T$ ) of nitrogen. Separately, prepare a constant amount of a uniform gas mixture with the nitrogen concentration of about 0.5% (vol) by mixing a constant amount of nitrogen, measured exactly, with the carrier

gas given below. Use this as the standard gas mixture. Introduce the standard gas mixture into a gas measuring tube with same amount at the same flow rate, proceed as directed for Argon, and obtain the peak area ( $A_S$ ) of nitrogen in the gas mixture. Determine the amount (% (vol)) of nitrogen in Argon by the formula:

$$\text{Amount (\% (vol)) of nitrogen (N}_2\text{)} = V_S \times \frac{A_T}{A_S}$$

$V_S$ : Amount (% (vol)) of nitrogen in the standard gas mixture

#### *Operating Conditions*

Detector: Thermal conductivity detector

Column: A stainless steel tube (about 3 mm internal diameter and about 3 m length)

Column packing material: 180–250  $\mu\text{m}$  zeolite for gas chromatography

Column temperature: A constant temperature of 50–150°C

Carrier gas: Hydrogen or helium

Flow rate: A constant rate of 20–40 mL/min

Injection: Loop injection using a gas measuring tube

#### (iii) Total amount

Determine the total amount of oxygen and nitrogen from the amount (% (vol)) of oxygen obtained in (i) and the amount (% (vol)) of nitrogen obtained in (ii) by the formula:

$$\text{Total amount (\% (vol)) of oxygen and nitrogen (\% (vol))} = V_O + V_N$$

$V_O$  : Amount (% (vol)) of oxygen obtained in (i)

$V_N$  : Amount (% (vol)) of nitrogen obtained in (ii)

**Water content** Not more than 0.05% (vol)

Measure using capacitance moisture meter and determine the amount (% (vol)) of the water content from the obtained value.

**Assay** Calculate the content of Argon from the total amount of oxygen and nitrogen, and water content obtained in Purity (iii) by the formula:

$$\text{Content of argon (\% (vol))} = 100 - V_{ON} - V_W$$

$V_{\text{ON}}$  : Total amount (% (vol)) of oxygen and nitrogen

$V_{\text{W}}$ : Amount (% (vol)) of water content

**Reagent and test solutions** Argon Ar [K1105, Second grade] [7440-37-1]

**Measurement instruments**

For a yellow phosphor luminescent oxygen analyzer and a capacitance moisture meter, use units meeting Japanese Industrial Standards K1105.