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Methods for determination of acrolein in flue gas

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law:

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Methods for determination of acrolein in flue gas

1 Scope This Japanese Industrial Standard specifies methods for determination of acrolein (acrylaldehyde) in flue gas.

Remarks 1 In this Standard, flue gas means ones which are generated by being accompanied with works for production or use of acrolein in the manufacturing processes of various chemicals and exhausted out to flue, chimney or duct.

2 The normative references to this Standard are shown in Attached Table 1.

2 Common items The common items concerned with chemical analysis, sampling method of flue gas, gas chromatographic analysis and molecular absorptiometric analysis shall be in accordance with JIS K 0050, JIS K 0095, JIS K 0114 and JIS K 0115 respectively.

3 Classification of analytical methods and their outlines Classification of analytical methods and their outlines shall be as shown in Table 1.

Table 1 Classification of analytical methods and their outlines

Classification of analytical methods	Outline of analytical method			Application requirement
	Summary	Sampling	Range of determination (ppm)	
Gas chromatography	Collect the sample gas in a vacuum collecting bottle, condense at low temperature or as it is and inject the gas into the gas chromatograph with hydrogen flame ionization detector. Determine acrolein with chromatogram obtained.	Vacuum collecting bottle method	0.01 ppm to 1 000 ppm (For 1 l of sampling gas)	
Hexylresorcinol absorptiometry	After absorbing acrolein in flue gas into a absorption solution, develop the colour by heating and measure the absorbance (605 nm) of this solution.	Absorption bottle method Absorption solution : Mixed solution of trichloroacetic acid, mercury (II) chloride and 4-hexylresorcinol Volume : 50 ml	5 to 2 000 (For 20 l of sampling gas)	In accordance with 5.2.1

4 Gas sampling method Gas sampling method shall be as follows.

Sample gas shall be collected at least two times as a rule in a same position within adjacent times and analyzed respectively .

4.1 Sampling position of gas Sampling position of gas for analysis shall be selected the point where the typical gas is collected, for example the point where the flow rate of gas does not remarkably change.

4.2 Classification of sampling methods There are two types of method. One is for 1 l or under (vacuum collecting bottle method) and the other for approx. 20 l (absorption bottle method).

4.3 When sampling gas volume is 1 l or under This method shall be applied for the gas chromatography.

4.3.1 Vacuum collecting bottle The vacuum collecting bottle, as shown in Fig. 4 (b-2) of JIS K 0095, which is 1 l of inner capacity with a fluoride resin valve requiring no grease and with a silicone rubber plug ⁽¹⁾.

Note ⁽¹⁾ The inside of the bottle shall be washed previously with a detergent.

When low temperature concentration method is employed, inner volume of the bottle shall be measured.

4.3.2 Sampling of gas Before sampling of the gas, air in the vacuum collecting bottle shall be evacuated. When sampling of gas is carried out, open the valves of the bottle and introduce the sample gas from the gas sampling tube (Approx. 2 mm to 3 mm inner diameter) through a dehumidification tube ⁽²⁾.

Note ⁽²⁾ Temperatures of atmosphere and flue gas shall be measured preliminarily. Those data can be used when the correction is required. Except where the flue gas temperature is remarkably high, atmospheric temperature may use as the temperature of sample gas at the time of sampling.

4.4 When sampling gas volume is approx. 20 l This method shall be applied for the Hexylresorcinol absorptiometry.

4.4.1 Reagents and preparation of reagent solution

(1) Reagents

- (a) **Water** A2 grade specified in JIS K 0557.
- (b) **Ethanol** specified in JIS K 8102.
- (c) **4-hexylresorcinol** (melting point 68 °C to 70 °C)
- (d) **Mercury (II) chloride** specified in JIS K 8139.
- (e) **Trichloroacetic acid** specified in JIS K 8667.

(2) Preparation of absorption stock solution Preparation of stock solution for absorption shall be as follows.