

## INDUSTRY STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

### HJ 1153-2020

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**Stationary pollution source waste gas Determination of  
aldehydes and ketones solution absorption-high performance  
liquid chromatography**

固定污染源废气 醛、酮类化合物的测定 溶液吸收-高效液相色谱法

**(English Translation)**

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## Foreword

To implement the "Environmental Protection Law of the People's Republic of China" and "The Air Pollution Prevention and Control Law of the People's Republic of China", and protect the ecology the environment, to protect human health, to standardize the determination methods of aldehydes and ketones in waste gas from stationary sources, and to formulate this standard.

This standard specifies the high performance liquid chromatography method for the determination of aldehydes and ketones in waste gas from stationary sources.

Appendix A of this standard is a normative appendix, and Appendix B and Appendix C are informative appendices.

This standard is issued for the first time.

This standard was formulated by the Department of Ecological Environment Monitoring and the Department of Regulations and Standards of the Ministry of Ecology and Environment.

Drafting organization of this standard. Shenyang Ecological Environment Monitoring Center of Liaoning Province.

Verification units of this standard. Liaoning Province Ecological Environment Monitoring Center, Tianjin Ecological Environment Monitoring Center, Dalian Health Environmental Monitoring Center, Anshan Ecological Environmental Monitoring Center of Liaoning Province, Fushun Ecological Environmental Monitoring Center of Liaoning Province, Shenyang City Health Environmental Affairs Service and Administrative Law Enforcement Center.

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This standard is interpreted by the Ministry of Ecology and Environment.

Determination of aldehydes and ketones in waste gas from stationary sources Solution absorption-high performance liquid chromatography Warning. The acid and organic reagents used in the experiment are strongly corrosive, irritating and toxic. The reagent preparation process the pre-treatment process of samples and samples should be carried out in a fume hood; protective equipment should be worn as required during operation to avoid breathing in the respiratory tract and Touch skin and clothing.

## 1 Scope of application

This standard specifies the high performance liquid chromatography method for the determination of aldehydes and ketones in waste gas from stationary sources.

This standard applies to the organized emission of formaldehyde, acetaldehyde, acrolein, acetone, propionaldehyde, crotonaldehyde, Determination of 12 aldehydes and ketones including 2-butanone, n-butyraldehyde, benzaldehyde, isovaleraldehyde, n-valeraldehyde and n-hexanal.

When the sample volume is 10.0 ml and the injection volume is 10  $\mu$ l, the minimum detectable amount of aldehyde and ketone compounds is 0.13  $\mu$ g~0.29  $\mu$ g, when collecting 20 L of organized exhaust gas (dry flue gas under standard conditions), the detection limit of the method is 0.01 mg/m<sup>3</sup>~ 0.02 mg/m<sup>3</sup>, the lower limit of determination is 0.04 mg/m<sup>3</sup>~0.08 mg/m<sup>3</sup>. See Appendix A for details.

## 2 Normative references

This standard quotes the following documents or their clauses. For undated reference documents, their valid versions are applicable to this standard.

GB/T 16157 Determination of particulate matter in exhaust from stationary sources and

sampling method for gaseous pollutants HJ/T 373 Fixed pollution source monitoring quality assurance and quality control technical specifications (trial implementation) HJ/T 397 Fixed source exhaust gas monitoring technical specification

### 3 Principles of the method

Organized emission of fixed pollution sources of aldehydes and ketones in exhaust gas in acidic medium and 2,4-dinitro in the absorption liquid Phenylhydrazine (DNPH) undergoes a derivatization reaction to generate 2,4-dinitrophenylhydrazone compounds, which are dissolved in a mixture of dichloromethane and n-hexane After extraction and concentration of liquid or dichloromethane, change the solvent to acetonitrile, separate by high performance liquid chromatography, UV or diode array detection Detector detection. Qualitatively based on retention time and quantified by external standard method.

### 4 Interference and elimination

Other organic compounds with the same retention time and absorption at 360 nm can interfere with the determination. You can change the mobile phase composition and other methods improve the separation conditions and avoid interference.

### 5 Reagents and materials

Unless otherwise specified, analytical reagents conforming to national standards are used for analysis, and the experimental water is newly prepared ultrapure water.

#### 5.1

Acetonitrile ( $\text{CH}_3\text{CN}$ ). pure by high performance liquid chromatography.

#### 5.2

Dichloromethane ( $\text{CH}_2\text{Cl}_2$ ). pure by high performance liquid chromatography.

#### 5.3

n-hexane ( $\text{C}_6\text{H}_{14}$ ). pure by high performance liquid chromatography.

#### 5.4

Hydrochloric acid (HCl).  $\rho=1.19 \text{ g/ml}$ , excellent grade pure.

5.5 2,4-Dinitrophenylhydrazine (DNPH).  $w \geq 98.0\%$ .

#### 5.6

Acrolein ( $\text{C}_3\text{H}_4\text{O}$ ).  $w \geq 98.0\%$ .

#### 5.7

Ccrotonaldehyde ( $\text{C}_4\text{H}_6\text{O}$ ).  $w \geq 98.0\%$ .

#### 5.8

Dichloromethane-n-hexane mixed solution. 37, ready for use.

#### 5.9

Anhydrous sodium sulfate ( $\text{Na}_2\text{SO}_4$ ). Burn at  $450^\circ\text{C}$  for 4 h, cool, and store in a ground glass bottle sealed.

#### 5.10

Standard stock solutions of 12 aldehydes and ketones-DNPH derivatives.  $\rho=100\text{ }\mu\text{g/ml}$  (calculated as aldehydes and ketones).

Directly purchase commercially available certified standard solutions of aldehydes and ketones-DNPH derivatives, the solvent is acetonitrile, and the mass concentration is based on aldehydes and ketones.

Class compound meter. Refer to the certificate of the standard solution for storage. After opening the package, keep it airtight below  $4^\circ\text{C}$  and keep it away from light. 2 can be stored month.

#### 5.11

Aldehydes and ketones-DNPH derivatives standard liquid.  $\rho=10.0\text{ }\mu\text{g/ml}$  (calculated as aldehydes and ketones).

Pipette 1.00 ml aldehyde and ketone-DNPH derivative standard stock solution (5.10) into a 10 ml volumetric flask, use acetonitrile (5.1) Dilute and dilute to the mark and mix well. It can be stored for 2 months in airtight, dark and cold storage below  $4^\circ\text{C}$ .

#### 5.12

Standard stock solution of aldehydes and ketones.  $\rho=1000\text{ }\mu\text{g/ml}$ .

Directly purchase commercially available standard solutions of aldehydes and ketones with acetonitrile as the solvent. Refer to the standard solution certificate for guarantee Store, after opening, airtight and refrigerate below  $4^\circ\text{C}$ , avoid light, and can be stored for two weeks.

#### 5.13

Standard liquid for aldehydes and ketones.  $\rho=100\text{ }\mu\text{g/ml}$ .

Pipette 1.00 ml aldehyde and ketone standard stock solution (5.12) into a 10 ml volumetric flask and dilute with acetonitrile (5.1) and dilute to the marking line and mix well. Store in airtight, dark and cold storage below  $4^\circ\text{C}$  for two weeks.

#### 5.14

Acrolein standard stock solution.  $\rho\sim 1000\text{ }\mu\text{g/ml}$ .

Weigh 0.100 g of acrolein (5.6), dissolve it with acetonitrile (5.1) in a 100 ml volumetric