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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 16781.1-2017

Replacing GB/T 16781.1-2008

**Natural gas -- Determination of mercury -- Part 1: Sampling of
mercury by chemisorption on iodine**

天然气汞含量的测定 第1部分：碘化学吸附取样法

(English Translation)

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Foreword

GB/T 16781 "Determination of mercury content in natural gas" is divided into the following two parts.

--- Part 1. Iodine chemical adsorption sampling method;

--- Part 2. Gold/platinum amalgam sampling method.

This section GB/T 16781 Part 1.

This section drafted in accordance with GB/T 1.1-2009 given rules.

This Part replaces GB/T 16781.1-2008 "Determination of mercury content in natural gas - Part 1. Iodine chemical adsorption sampling method." this section compared with GB/T 16781.1-2008, the main technical changes are as follows.

--- Chapter 4 test principle part of the "mercury in the form of water-soluble complex was alkaline tin salt (II) solution was reduced to elemental mercury" Amend to read "Mercury in water-soluble complexes reduced to elemental mercury by alkaline tin salts (II) or potassium borohydride solution";

--- 6.4 to restore the solution part, an increase of potassium borohydride reduction solution and carrier solution;

--- 6.5.1 of the contents of the original standard content of "mercury stock solution, the mass concentration $\rho(\text{Hg}) = 1.000\text{g/L}$, traceable to the national standard Quality "to" mercury standard solution, the national secondary or national standard substance, the mass concentration of $\rho(\text{Hg}) = 1\text{mg/L} \sim 1000\text{mg/L}$, Priority to use low concentrations of reference material to reduce the error caused by multi-level dilution ";

--- 8.1 Supplement. The use of flow injection and continuous flow system, you can also use the current carrying solution (6.4.3.2) and potassium borohydride also the original solution (6.4.2), the reduction of mercury compounds to elemental mercury. Mercury is stripped with inert gas and AAS or AFS instruments are used Detection.

This section uses the redrafted law Amendment uses ISO 6978-1:2003 "Determination of mercury content in natural gas - Part 1. Iodine chemical absorption Attached sample method ", the main difference with ISO 6978-1:2003 Appendix A Please note that some of this document may be patentable. The issuing agencies of this document do not bear the responsibility of identifying these patents.

This part of the National Natural Gas Standardization Technical Committee (SAC/TC244) and focal point.

This part of the drafting unit. China Southwest Oil and Gas Field Branch of Natural Gas Research Institute, China's oil and gas quality control and energy measurement Key Laboratory of Oil Industry Natural Gas Quality Supervision and Inspection Center.

Introduction

Natural gas may contain some amount of mercury, which is usually present in elemental form. Need to purify the gas with high mercury content, this will not only avoid the condensation of mercury during handling and delivery, but also meet the gas sales contract requirements. Natural gas liquefaction regulations can only contain Low concentration of mercury, this is to avoid serious corrosion problems, such as corrosion of liquefaction equipment aluminum heat exchanger.

The presence of natural gas-containing hydrocarbons, especially low-concentration aromatics, can interfere with atomic absorption spectroscopy (AAS) or atomic fluorescence spectroscopy (AFS) for the determination of mercury, so the mercury in natural gas can not be directly measured at this time. Therefore, it is necessary to collect mercury to make it fragrant before analysis Hydrocarbon separation.

The purpose of measuring mercury content is.

--- Monitoring gas quality;

Monitor the removal of mercury from the gas treatment plant.

Several methods have been developed for collecting or enriching mercury from natural gas. Mercury collection from dry natural gas usually does not involve special problems. But in Mercury sampling should be used when natural gas is close to condensate (see ISO 6570).

The two parts of GB/T 16781 describe the principle of mercury sampling, the provisions of the mercury sampling method and the determination of mercury in natural gas pipelines General requirements. This section provides iodine impregnated silica gel chemical sampling method, while the second part of the provisions of the gold/platinum alloy amalgam sampling.

Natural gas - Determination of mercury content Part 1. Iodine chemical adsorption sampling method Warning - This section does not include all the security issues related to their application. Before using this section, the user has the responsibility to formulate the corresponding Safety and protection measures, and define the scope of its application.

1 Scope

This section GB/T 16781 specifies the method of iodine impregnated silica gel chemical adsorption sampling method for the determination of mercury in natural gas, sampling pressure Force up to 40MPa.

This section applies to the determination of natural gas content of 0.1 μ g/m³ ~ 5000 μ g/m³ range of mercury.

This section applies to the volume of sample taken hydrogen sulfide less than 20mg; and under the conditions of sampling liquid hydrocarbon condensate total less than 10g/m³ of sample gas. The amount of mercury vapor collected is determined by measuring the absorbance or fluorescence of the mercury vapor at a wavelength of 253.7 nm.

2 Normative references

The following documents for the application of this document is essential. For dated references, only the dated version applies to this article Pieces. For undated references, the latest edition (including all amendments) applies to this document.

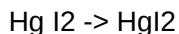
GB/T 13609 Natural gas sampling guidelines (GB/T 13609-2012, ISO 10715:1997, EQV)
 GB/T 20604 natural gas vocabulary (GB/T 20604-2006, ISO 14532:2001, IDT) ISO 6570
 Natural gas - Determination of potential hydrocarbon content Weighing method
 (Naturalgas-Determinationofpotentialhydrocarbonliquidcontent-Gravimetricmethods)

3 Terms and definitions

GB/T 20604 defined terms and definitions apply to this document.

4 Test principle

The gas passes through a glass tube containing iodine-impregnated silica gel. The gas contains elemental mercury and organic mercury compounds [such as dimethylmercury $\text{Hg}(\text{CH}_3)_2$ or Mercury in the form of diethylmercury $\text{Hg}(\text{C}_2\text{H}_5)_2$] is chemisorbed and the reaction equation is as follows.



$\text{Hg}(\text{CH}_3)_2 \text{ I}_2 \rightarrow \text{HgI}_2 2\text{CH}_3\text{I}$ the resulting mercuric iodide (HgI_2) was dissolved in a laboratory with iodinated amine/iodine solution ($\text{NH}_4\text{I}/\text{I}_2$) and the hydrocarbon condensate removed by vacuum stripping. To Mercury in the form of a water-soluble complex is reduced to elemental mercury by an alkaline tin salt (II) or potassium borohydride solution. Mercury is removed from the solution with inert gas Stripped, the mercury vapor is transferred to a cold atomic absorption spectrometer (AAS) or atomic fluorescence spectrometer (AFS) at a wavelength of 253.7 nm Determination. In the same way, the final mercury determination was calibrated using a mercury standard solution that was compatible with the matrix solution.

5 Instruments

5.1

The parameters that affect the measurement should be traceable to national or international standards. Volumetric measurements (volume, temperature, gas pressure and atmospheric pressure)