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Natural gas-Determination of oxygen-Electrochemical method

天然气 氧气含量的测定 电化学法

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Foreword

This document complies with the provisions of GB/T 1:1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents" Drafting:

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Determination of oxygen content of natural gas by electrochemical method

1 Scope

This document describes the principles, reagents and materials, instruments, sampling, measurement steps, and data for the determination of oxygen content in natural gas using electrochemical methods:

Data processing, precision and measurement reports:

This document is suitable for online and offline determination of oxygen content in natural gas, with a measurement range of 0.0001%~1.0% (volume fraction):

2 Normative reference documents

GB/T 13609

GB/T 20604

3 Terms and definitions

The terms and definitions defined in GB/T 20604 and the following apply to this document:
3.1 A sensor that uses the measured electrochemical reaction to convert its changes into potential changes, current changes, or conductivity changes:

[Source: GB/T 7665-2005,3.1:26]

4 Principles

Under certain pressure and flow rate conditions, the oxygen molecules in the natural gas sample diffuse to the oxygen electrode of the electrochemical sensor for electrolysis:

chemical reaction, producing an electrical signal proportional to the oxygen content:
Telecommunications by comparing the sample to be measured with a standard gas sample of known oxygen content When the signal is output, the oxygen content of the sample to be measured can be obtained: The electrochemical reaction equation for lead as an anode is as follows:

$O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$ (cathode reaction) $2Pb + 4OH^- \rightarrow 2PbO + 2H_2O + 4e^-$ (anodic reaction) $2Pb + O_2 \rightarrow 2PbO$ (total reaction formula)

5 Reagents and materials

5:1 Oxygen standard material: The oxygen-containing gas standard material in methane should be used:

5:2 Nitrogen: purity (volume fraction) not less than 99.999%:

5:3 Alkali absorption solution: Prepared with chemical reagents that can absorb hydrogen sulfide, such as using industrially pure sodium hydroxide to prepare 10% (mass fraction) Sodium hydroxide solution:

5:4 Sampling materials: Stainless steel cylinders should be used for sampling during offline measurement: