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Analysis of natural gas — Biomethane — Determination of ammonia content by tuneable diode laser absorption spectroscopy

Analyse du gaz naturel — Biométhane — Détermination de la teneur en ammoniac par spectroscopie d'absorption laser à diode accordable

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Foreword

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This document was prepared by Technical Committee ISO/TC 193, *Natural gas*, Subcommittee SC 1, *Analysis of natural gas*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 408, *Natural gas and biomethane for use in transport and biomethane for injection in the natural gas grid,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Ammonia is a common trace impurity found in biomethane. It is a product from the anaerobic digestion of biomass, formed from the breakdown of amino acids during the production of biogas. As an impurity in biogas and biomethane, ammonia is corrosive when it dissolves in the presence of water, damaging process equipment and leads to an increase in anti-knock processes in combustion engines when used as a fuel for vehicles. Ammonia is detrimental to the environment and as an air pollutant forms particulates which are damaging to public health. Additionally, when present in the combustion of biomethane, ammonia can lead to the formation of nitrogen oxides (NO_x), which are regulated pollutants as they are toxic and affect air quality. Therefore, the presence of ammonia in biogas and biomethane is undesirable to gas distributers and their customers.

Measuring ammonia content in mixtures of methane at the trace level (i.e. mg m^{-3}) is technically difficult due to the adsorptive nature (i.e. "stickiness") of ammonia. Particularly spectral NH_3 measurements can be severely hampered by spectral interferences from the matrix gas components, which further increases the complexity of these measurements. Measurements in biogas or biomethane are also dangerous due to the potentially explosive nature of methane, when mixed with an oxidizer like ambient air.

This method supports the implementation of specifications for biomethane and biogas such as EN 16723-1[8] and EN 16723-2[9] when used in the natural gas grids and when using it as a transportation fuel. Implementation of these specifications require fit-for-purpose measurement methods with known performance and acceptable metrological traceability to support the trade of renewable gases as well as conformity assessment. Currently, methods are referenced in standards such as EN 16723-1 which have not been validated for use with biomethane and biogas. This document describes measurement methods that meet these requirements and can be implemented by laboratories and industry, also those seeking accreditation on the basis of, e.g. ISO/IEC 17025.

The methods described are based on commercially available spectroscopic analysers, specific to the measurement of ammonia. They have been shown to perform at an acceptable level when quantifying the ammonia content of biomethane at the 10 mg m^{-3} level, as specified in, e.g. EN 16723-1.