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1 December 2019

**Committee D03 on Gaseous Fuels
Subcommittee D03.14 on Hydrogen and Fuel Cells**

Research Report: D03-1011

**Interlaboratory Study to Establish Precision Statements for ASTM
D7649-19, Determination of Trace Carbon Dioxide, Argon, Nitrogen,
Oxygen and Water in Hydrogen Fuel by Jet Pulse Injection and Gas
Chromatography/Mass Spectrometer Analysis**

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1. Introduction:

Interlaboratory Study 775 was conducted to establish a precision statement for D7649, Determination of Trace Carbon Dioxide, Argon, Nitrogen, Oxygen and Water in Hydrogen Fuel by Jet Pulse Injection and Gas Chromatography/Mass Spectrometer Analysis.

2. Test Method:

The Test Method used for this ILS is D7649-19. To obtain a copy of D7649, go to ASTM's website, www.astm.org, or contact ASTM Customer Service by phone at 610-832-9585 (8:30 a.m. - 4:30 p.m. Eastern U.S. Standard Time, Monday through Friday) or by email at service@astm.org.

3. Participating Laboratories:

The following laboratories participated in this interlaboratory study:

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4. Description of Samples:

There were 3 samples of varying targeted results used for this study. Each sample was prepared and distributed by Dr. Stephen Miller of Air Liquide. Below is a list of the samples with the corresponding supplier:

1. Blend 1
 Provided by Air Liquide
2. Blend 2
 Provided by Air Liquide
3. Blend 3
 Provided by Air Liquide

5. Description of Equipment/Apparatus¹:

For information on the equipment/apparatus used by each laboratory, please see Annex A.

6. Data Report Forms:

Each laboratory was provided with a data report form for the collection of data. A copy of the data is provided in Annex B.

¹ The equipment listed was used to develop a precision statement for D7649-19. This listing is not an endorsement or certification by ASTM International.

Please note: The laboratories have been randomly coded and cannot be identified herein.

7. Statistical Data Summary:

A summary of the statistics calculated from the data returned by the participating laboratories is provided in Annex C.

8. Precision and Bias Statement:

Taken from section 13 of D7649

8.1 The precision of this test method is based on an interlaboratory study of ASTM D7649, Standard Test Method for Determination of Trace Carbon Dioxide, Argon, Nitrogen, Oxygen and Water in Hydrogen Fuel by Jet Pulse Injection and Gas Chromatography/Mass Spectrometer Analysis, conducted in 2018. A single laboratory participated in this study, testing three different blends for five elements and compounds. Every “test result” represents an individual measurement. Seven replicate test results were reported. Except for the number of participating laboratories, Practice E691 was followed for the design of the study and analysis of the data; the details are given in ASTM Research Report No. D03-1011.

8.1.1 Repeatability limit (r) - The difference between repetitive results obtained by the same operator in a given laboratory applying the same test method with the same apparatus under constant operating conditions on identical test material within short intervals of time would in the long run, in the normal and correct operation of the test method, exceed the following values only in one case in 20.

8.1.1.1 Repeatability can be interpreted as maximum difference between two results, obtained under repeatability conditions, that is accepted as plausible due to random causes under normal and correct operation of the test method.

8.1.1.2 Repeatability limits are listed in Tables 1 - 5 below.

8.1.2 Reproducibility limit (R) - The difference between two single and independent results obtained by different operators applying the same test method in different laboratories using different apparatus on identical test material would, in the long run, in the normal and correct operation of the test method, exceed the following values only in one case in 20.

8.1.2.1 Reproducibility can be interpreted as maximum difference between two results, obtained under reproducibility conditions, that is accepted as plausible due to random causes under normal and correct operation of the test method.