This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: D7653 – 18

Standard Test Method for Determination of Trace Gaseous Contaminants in Hydrogen Fuel by Fourier Transform Infrared (FTIR) Spectroscopy[1]

This standard is issued under the fixed designation D7653; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method employs an FTIR gas analysis system for the determination of trace impurities in gaseous hydrogen fuels relative to the hydrogen fuel quality limits described in SAE TIR J2719 (April 2008) or in hydrogen fuel quality standards from other governing bodies. This FTIR method is used to quantify gas phase concentrations of multiple target contaminants in hydrogen fuel either directly at the fueling station or on an extracted sample that is sent to be analyzed elsewhere. Multiple contaminants can be measured simultaneously as long as they are in the gaseous phase and absorb in the infrared wavelength region. The detection limits as well as specific target contaminants for this standard were selected based upon those set forth in SAE TIR J2719.

1.2 This test method allows the tester to determine which specific contaminants for hydrogen fuel impurities that are in the gaseous phase and are active infrared absorbers which meet or exceed the detection limits set by SAE TIR J2719 for their particular FTIR instrument. Specific target contaminants include, but are not limited to, ammonia, carbon monoxide, carbon dioxide, formaldehyde, formic acid, methane, ethane, ethylene, propane, and water. This test method may be extended to other impurities provided that they are in the gaseous phase or can be vaporized and are active infrared absorbers.

1.3 This test method is intended for analysis of hydrogen fuels used for fuel cell feed gases or for internal combustion engine fuels. This method may also be extended to the analysis of high purity hydrogen gas used for other applications including industrial applications, provided that target impurities and required limits are also identified.

1.4 This test method can be used to analyze hydrogen fuel sampled directly at the point-of-use from fueling station nozzles or other feed gas sources. The sampling apparatus includes a pressure regulator and metering valve to provide an appropriate gas stream for direct analysis by the FTIR spectrometer.

1.5 This test method can also be used to analyze samples captured in storage vessels from point-of-use or other sources. Analysis of the stored samples can be performed either in a mobile laboratory near the sample source or in a standard analytical laboratory.

1.6 A test plan should be prepared that includes (1) the specific impurity species to be measured, (2) the concentration limits for each impurity species, and (3) the determination of the minimum detectable concentration for each impurity species as measured on the apparatus before testing.

1.7 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.7.1 *Exception*—All values are based upon common terms used in the industry of those particular values and when not consistent with SI units, the appropriate SI unit will be included in parentheses after the common value usage (4.4, 7.8, 7.9, 10.5, and 11.6).

1.8 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.9 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D5287 Practice for Automatic Sampling of Gaseous Fuels

[1] This test method is under the jurisdiction of ASTM Committee D03 on Gaseous Fuels and is the direct responsibility of Subcommittee D03.14 on Hydrogen and Fuel Cells.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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