Designation: D5273 – 23

Standard Guide for Analysis of Propylene Concentrates[1]

This standard is issued under the fixed designation D5273; 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 guide covers a list of the major grades of propylene concentrates produced in North America. It includes possible components and test methods, both ASTM and other, either actually used, or believed to be in use, to test for these properties. This guide is not intended to be used or construed as a set of specifications for any grade of propylene concentrate.

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

1.3 *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.*

1.4 *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]

D2163 Test Method for Determination of Hydrocarbons in Liquefied Petroleum (LP) Gases and Propane/Propene Mixtures by Gas Chromatography

D2384 Test Methods for Traces of Volatile Chlorides in Butane-Butene Mixtures

D2504 Test Method for Noncondensable Gases in C_2 and Lighter Hydrocarbon Products by Gas Chromatography (Withdrawn 2024)[3]

D2505 Test Method for Ethylene, Other Hydrocarbons, and Carbon Dioxide in High-Purity Ethylene by Gas Chromatography

D2712 Test Method for Determination of Hydrocarbon Impurities in High Purity Propylene by Gas Chromatography

D3227 Test Method for (Thiol Mercaptan) Sulfur in Gasoline, Kerosine, Aviation Turbine, and Distillate Fuels (Potentiometric Method)

D3246 Test Method for Sulfur in Petroleum Gas by Oxidative Microcoulometry (Withdrawn 2024)[3]

D3700 Practice for Obtaining LPG Samples Using a Floating Piston Cylinder

D4178 Practice for Calibrating Moisture Analyzers

D4468 Test Method for Total Sulfur in Gaseous Fuels by Hydrogenolysis and Rateometric Colorimetry

D4629 Test Method for Trace Nitrogen in Liquid Hydrocarbons by Syringe/Inlet Oxidative Combustion and Chemiluminescence Detection

D4864 Test Method for Determination of Traces of Methanol in Propylene Concentrates by Gas Chromatography (Withdrawn 2016)[3]

D5454 Test Method for Water Vapor Content of Gaseous Fuels Using Electronic Moisture Analyzers

D5623 Test Method for Sulfur Compounds in Light Petroleum Liquids by Gas Chromatography and Sulfur Selective Detection

D6667 Test Method for Determination of Total Volatile Sulfur in Gaseous Hydrocarbons and Liquefied Petroleum Gases by Ultraviolet Fluorescence

D6729 Test Method for Determination of Individual Components in Spark Ignition Engine Fuels by 100 Metre Capillary High Resolution Gas Chromatography

D7423 Test Method for Determination of Oxygenates in C2, C3, C4, and C5 Hydrocarbon Matrices by Gas Chromatography and Flame Ionization Detection

[1] This guide is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.D0.03 on Propylene.

Current edition approved Dec. 1, 2023. Published January 2024. Originally approved in 1992. Last previous edition approved in 2018 as D5273 – 18. DOI: 10.1520/D5273-23.

[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.

[3] The last approved version of this historical standard is referenced on www.astm.org.

***A Summary of Changes section appears at the end of this standard**

D7994 Test Method for Total Fluorine, Chlorine, and Sulfur in Liquid Petroleum Gas (LPG) by Oxidative Pyrohydrolytic Combustion Followed by Ion Chromatography Detection (Combustion Ion Chromatography-CIC)

D8098 Test Method for Permanent Gases in C_2 and C_3 Hydrocarbon Products by Gas Chromatography and Pulse Discharge Helium Ionization Detector

2.2 *UOP Standard:*[4]

UOP 212 Hydrogen Sulfide, Mercaptan Sulfur, and Carbonyl Sulfide in Hydrocarbon Gases by Potentiometric Titration

UOP 603 Trace CO and CO_2 in Hydrogen and Light Gaseous Hydrocarbons by GC

3. Terminology

3.1 *Definitions:*

3.1.1 *outaging, n*—practice of removing a portion of liquid contents from a conventional sampling cylinder after filling to provide expansion room.

3.1.2 *propylene concentrate, n*—hydrocarbon product containing more than 50 % propylene.

3.1.2.1 *Discussion*—Grades of propylene concentrates listed in this guide are: polymer, 99.0 % minimum propylene content; chemical, 92.0 %; and refinery, 60 %.

3.2 *Abbreviations:*

3.2.1 *AgDDC, n*—silver diethyldithiocarbamate.

3.2.2 *GC, n*—gas chromatograph.

3.2.3 *GC-AED, n*—gas chromatography atomic emission detector.

3.2.4 *GC-ECD, n*—gas chromatography electron capture detector.

3.2.5 *GC-FPD, n*—gas chromatography flame photometric detector.

3.2.6 *GC-PID, n*—gas chromatography photoionization detector.

3.2.7 *GC-SCD, n*—gas chromatography sulfur chemiluminescent detector.

3.2.8 *IC, n*—ion chromatography.

3.2.9 *ICP-MS, n*—inductively coupled plasma-mass spectrometry.

3.2.10 *LPG or LP gases, n*—liquefied petroleum gas.

4. Significance and Use

4.1 This guide is intended to provide information on the likely composition of propylene concentrates and on probable ways to test them. Since there are currently no ASTM test methods for determining all components of interest, this guide provides information on other potentially available test methods.

4.2 Although this guide is not to be used for specifications, it can provide a starting point for parties to develop mutually agreed upon specifications which meet their respective requirements. It can also be used as a starting point in finding suitable test methods for determining various components of propylene.

5. Sampling

5.1 *General*—Sample propylene concentrates are to be analyzed for trace components by a technique that minimizes or eliminates losses of light components and concentration of heavy ones. The sections below list some different sampling methods and principles. However, it is not the intent of this guide to list procedures that are applicable to all sampling situations. It is strongly recommended that samples be obtained under the supervision of a person with wide knowledge and experience in sampling olefinic liquefied petroleum gases. Also, even though this guide does not address the location of a sampling point in a line or vessel, the importance of the proper sampling location cannot be overemphasized.

5.2 *Floating Piston Cylinder*—Test Method D3700 meets the criterion of minimizing or eliminating loss of light compounds and concentration of heavy ones. However, some labs have safety codes preventing use of rupture-disc piston containers. Alternative procedures must be used in these labs.

5.3 *Conventional Outaging Method*—The widely used outaging technique (that is, the practice of removing a portion of the fluid contents from a conventional sampling cylinder after filling in order to provide expansion room) causes a loss of light components into the vapor space. Subsequent handling to recapture these light ends in the liquid phases of the sample, such as repressurization of the cylinder contents with an inert gas, will not completely effect their recovery, especially the permanent gases. However, the loss is not significant to some users.

5.4 *Vaporization Methods*—Vaporization of the sample, either at the source or in the lab prior to analysis, can cause loss of heavier components, if present, and concentration of lighter ones. Test Method D2712 describes a low pressure vaporization sampling technique that is suitable to determine trace compounds through butadiene.

5.5 *Reactive and Polar Components:*

5.5.1 Determination of reactive components, such as certain sulfur compounds and arsine, is generally believed to require special sample containers, such as glass-lined, TFE-fluorocarbon-lined cylinders, or other containers that have been specially passivated.

5.5.2 It is very difficult to obtain a valid sample to determine traces of polar compounds, such as oxygen, water, and ammonia, in the lab. Online analyzers, if available, or sorption of the analyte at the sample source for subsequent lab analysis, are believed to yield the most accurate results.

6. Composition and Test Methods

6.1 Table 1 indicates possible composition ranges and ASTM test methods for different grades of propylene concentrates. Table 2 lists other test methods known or believed to be in use.

6.2 Listing of any given component in Table 1 does not mean that the component will be present in all, or even any,

[4] Available from ASTM International at www.astm.org, or contact ASTM Customer Service at service@astm.org.