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Standard Guide for Purity of Carbon Dioxide Used in Supercritical Fluid Applications¹

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INTRODUCTION

The rapid commercial development of carbon dioxide for use in supercritical fluid extraction (SFE) and supercritical fluid chromatography (SFC) has hastened the need to establish common purity standards to be specified by specialty gas suppliers. As a consequence of its isolation from petrochemical side-streams or as a by-product of fermentation or ammonia synthesis, carbon dioxide contains a wide range of impurities that can interfere with analytical quantification or instrument operation. This guide is intended to serve as a guide to specialty gas suppliers for testing the suitability of carbon dioxide for use in SFC and SFE applications.

1. Scope

1.1 This guide defines purity standards for carbon dioxide to ensure the suitability of liquefied carbon dioxide gas for use in SFE and SFC applications (see Guide E 1449 for definitions of terms). This guide defines quantitation, labeling, and statistical standards for impurities in carbon dioxide that are necessary for successful SFE or SFC laboratory work, and it suggests methods of analysis for quantifying these impurities.

1.2 This guide is provided for use by specialty gas suppliers who manufacture carbon dioxide specifically for SFE or SFC applications. SFE or SFC CO₂ products offered with a claim of adherence to this guide will meet certain absolute purity and contaminant detectability requirements matched to the needs of current SFE or SFC techniques. The use of this guide allows different SFE or SFC CO₂ product offerings to be compared on an equal purity basis.

1.3 This guide considers contaminants to be those components that either cause detector signals that interfere with those of the target analytes or physically impede the SFE or SFC experiment.

1.4 The values stated in SI units are to be regarded as the standard.

1.5 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

¹ This guide is under the jurisdiction of ASTM Committee E13 on Molecular Spectroscopy and is the direct responsibility of Subcommittee E13.19 on Chromatography.

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D 2504 Test Method for Noncondensable Gases in C₃ and Lighter Hydrocarbon Products by Gas Chromatography²

D 2820 Test Method for C Through C₅ Hydrocarbons in the Atmosphere By Gas Chromatography³

D 3670 Guide for Determination of Precision and Bias of Methods of Committee D-22⁴

D 3686 Practice for Sampling Atmospheres to Collect Organic Compound Vapors (Activated Charcoal Tube Adsorption Method)⁴

D 3687 Practice for Analysis of Organic Compound Vapors Collected by the Activated Charcoal Tube Adsorption Methods⁴

D 4178 Practice for Calibrating Moisture Analyzers⁵

D 4532 Test Method for Respirable Dust in Workplace Atmosphere⁴

E 260 Practice for Packed Column Gas Chromatography⁶

E 355 Practice for Gas Chromatography Terms and Relationships⁶

E 594 Practice for Testing Flame Ionization Detectors Used in Gas Chromatography⁶

E 697 Practice for Use of Electron-Capture Detectors in Gas Chromatography⁶

E 1449 Guide for Supercritical Fluid Chromatography Terms and Relationships⁶

E 1510 Practice for Installing Fused Silica Open Tubular Capillary Columns in Gas Chromatographs⁶

2.2 CGA Publications:⁷

² Annual Book of ASTM Standards, Vol 05.01.

³ Discontinued—See 1992 Annual Book of ASTM Standards, Vol 05.01.

⁴ Annual Book of ASTM Standards, Vol 11.03.

⁵ Annual Book of ASTM Standards, Vol 05.02.

⁶ Annual Book of ASTM Standards, Vol 14.02.

⁷ Available from Compressed Gas Association, Inc., 1725 Jefferson Davis Highway, Arlington, VA 22202-4100.