



Standard Test Method for Determination of Carbohydrates in Biomass by Gas Chromatography¹

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INTRODUCTION

This test method gives a reproducible way to quantitatively determine in lignocellulosic materials the kind and amount of the structural carbohydrates made from arabinose, xylose, mannose, galactose, and glucose. This way is accomplished by first hydrolyzing the carbohydrates to their constituent monosaccharides. Subsequent derivatization produces the corresponding alditol acetates that are quantified using capillary gas chromatography.

1. Scope

1.1 This test method describes the determination of structural carbohydrates present in a biomass sample, expressed as the percent mass of an oven-dried sample basis of each anhydrosugar.

1.2 Sample materials suitable for this procedure include hard and softwoods, herbaceous materials, such as sericea and switchgrass, agricultural residues, such as corn stover, wheat straw, and bagasse, wastepaper, such as boxboard, office waste, and newsprint, acid or alkaline-pretreated biomass, washed free of any residual acid or alkali, and the solid fraction of fermentation residues.

1.3 The options for the types of samples to be analyzed in this procedure are:

1.3.1 Prepared Biomass Samples:

1.3.1.1 *Air Dried Material*—Results are reported as the percent by mass, based on the oven-dried mass of the air-dried sample.

1.3.1.2 *45°C Dried Material*—Results are reported as the percent by mass, based on the oven-dried mass of the 45°C dried sample.

1.3.1.3 *Freeze Dried Material*—Results are reported as the percent by mass, based on the oven-dried mass of the freeze dried sample.

1.3.2 *Extractives-Free Sample*—Results are reported as the percent by mass, based on the oven-dried mass of the extracted sample.

1.4 This standard method is generally not suitable for samples that contain soluble, nonstructural carbohydrates unless they are removed prior to analysis.

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

1.6 *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.* See Section 8 for specific hazards statements.

2. Referenced Documents

2.1 ASTM Standards:²

D1193 Specification for Reagent Water

E1690 Test Method for Determination of Ethanol Extractives in Biomass

E1721 Test Method for Determination of Acid-Insoluble Residue in Biomass

E1756 Test Method for Determination of Total Solids in Biomass

E1757 Practice for Preparation of Biomass for Compositional Analysis

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *anhydrosugars, n*—the nominal repeating unit of a polysaccharide. When polysaccharides undergo acid

¹ This test method is under the jurisdiction of ASTM Committee E48 on Bioenergy and Industrial Chemicals from Biomass and is the direct responsibility of Subcommittee E48.05 on Biomass Conversion.

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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.