



ISO/IEC 17025:2017-Accredited Testing Laboratory

November 21, 2024

Alexandra Garner
Guardian Innovations, LLC
3044, Adriatic Court
Peachtree Corners, GA 30071
USA

Dear Alexandra Garner,

Please find enclosed your radiocarbon (C14) report for the material recently submitted. The result is reported as “% Biobased Carbon”. This indicates the percentage carbon from “natural” (plant or animal by-product) sources versus “synthetic” (petrochemical) sources. For reference, 100 % Biobased Carbon indicates that a material is entirely sourced from plants or animal by-products and 0 % Biobased Carbon indicates that a material did not contain any carbon from plants or animal by-products. A value in between represents a mixture of natural and fossil sources.

The analytical measurement is cited as “percent modern carbon (pMC)”. This is the percentage of C14 measured in the sample relative to a modern reference standard (NIST 4990C). The % Biobased Carbon content is calculated from pMC by applying a small adjustment factor for C14 in carbon dioxide in air today. It is important to note is that all internationally recognized standards using C14 assume that the plant or biomass feedstocks were obtained from natural environments.

Reported results are accredited to ISO/IEC 17025:2017 PJLA #59423 standards and all chemistry was performed here in our laboratory and counted in our own accelerators in Miami, Florida.

The international standard method utilized for this analysis is cited under Summary of Results. The standard version used is the latest available as of the date reported (unless otherwise noted). The report also indicates if the result is relative to total carbon (TC) or only total organic carbon (TOC). When interpreting the results, please consider any communications you may have had with us regarding the analysis. If you have any questions, please contact us. We welcome your inquiries.

Sincerely,

Zeneida Cernada
Laboratory Management Group / IRMS / CRDS Instrument Manager



ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biobased Carbon Content ASTM

D6866-24 Method B (AMS) TOC

Validation: *Ymida fernada*

Certificate Number:

5194933F6549624FFBF473CCC4715C75

To validate report, scan this QR code on a mobile device or go to <https://verify.betalabservices.com> and enter the requested information.



Submitter	Alexandra Garner
Company	Guardian Innovations, LLC
Received Date	November 14, 2024
Report Date	November 21, 2024
Sample Code	Guardian Biobased TPE Infill / (USDA Application# 14641)

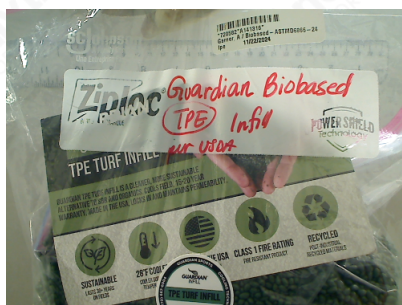
Result

49% Biobased Carbon Content (as a fraction of total organic carbon)

Laboratory Number Beta-720582

Percent modern carbon (pMC) 48.58 +/- 0.17 pMC

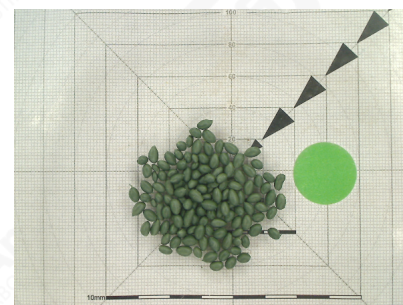
Atmospheric adjustment factor (REF) 99.7; = pMC/0.997



Labeling COC



View of Content



2506.9mg analyzed (1mm x 1mm scale)

Disclosures: All analytical work is performed by BETA Analytic's professional staff, in its laboratories on our AMS, IRMS, CRDS and GC instruments. No subcontractors are ever used. We are a tracer-free ¹⁴C facility that does not accept or analyze materials that might contain artificial ¹⁴C (from biomedical, environmental, or other studies). Quality Assurance is maintained through our ongoing ISO/IEC 17025:2017 Laboratory Testing Accreditation, and verified by Quality Assurance Reports, posted to the web-library along with this report.

The published report is final and non-modifiable.

This report has been built with the information provided on the online form by the client. If different reporting information is required, a new sample analysis must be performed, with a new online form filled out to include exactly the information requested on the form.

Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO₂ in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.



ISO/IEC 17025:2017-Accredited Testing Laboratory

Summary of Results - % Biobased Carbon Content ASTM

D6866-24 Method B (AMS) TOC

Validation: *Ymida Pennada*

Certificate Number:

5194933F6549624FFBF473CCC4715C75



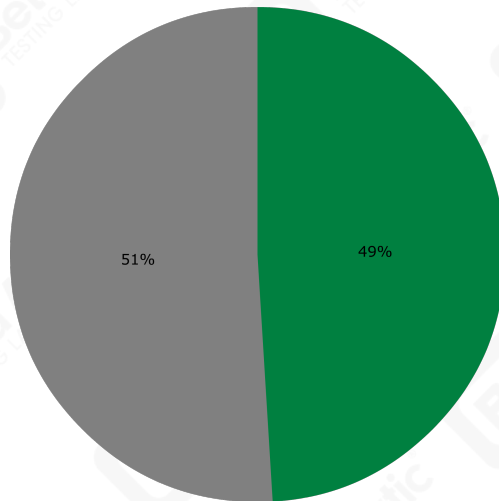
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Submitter	Alexandra Garner
Company	Guardian Innovations, LLC
Received Date	November 14, 2024
Report Date	November 21, 2024
Sample Code	Guardian Biobased TPE Infill / (USDA Application# 14641)

Result

49% Biobased Carbon Content (as a fraction of total organic carbon)

Laboratory Number	Beta-720582
Percent modern carbon (pMC)	48.58 +/- 0.17 pMC
Atmospheric adjustment factor (REF)	99.7; = pMC/0.997



	Biobased Carbon
	Fossil Carbon

Precision on the RESULT is cited as +/- 3% (absolute). The cited precision on the analytical measure (pMC) is 1 sigma (1 relative standard deviation). The reported result only applies to the analyzed material. The accuracy of the RESULT relies on the measured carbon in the analyzed material having been in recent equilibrium with CO₂ in the air and/or from fossil carbon (more than 45,000 years old) such as petroleum or coal. The RESULT only applies to relative carbon content, not to relative mass content. The RESULT is calculated by adjusting pMC by the applicable "Atmospheric adjustment factor (REF)" cited in this report.



% Biobased Carbon Content ASTM D6866-24 Method B (AMS) TOC

Explanation of Results

The result was obtained using the radiocarbon isotope (also known as Carbon-14, C14 or 14C), a naturally occurring isotope of carbon that is radioactive and decays in such a way that there is none left after about 45,000 years following the death of a plant or animal. Its most common use is radiocarbon dating by archaeologists. An industrial application was also developed to determine if consumer products and CO₂ emissions were sourced from plants/biomass or from materials such as petroleum or coal (fossil-based). By 2003 there was growing demand for a standardized methodology for applying Carbon -14 testing within the regulatory environment. The first of these standards was ASTM D6866-04, which was written with the assistance of Beta Analytic. Since ASTM was largely viewed as a US standard, European stakeholders soon began demanding an equivalent CEN standard while global stakeholders called for ISO standardization.

The analytical procedures for measuring radiocarbon content using the different standards are identical. The only difference is the reporting format. Results are usually reported using the standardized terminology “% biobased carbon”. Only ASTM D6866 uses the term “% biogenic carbon” when the result represents all carbon present (Total Carbon) rather than just the organic carbon (Total Organic Carbon). The terms “% biobased carbon” and “% biogenic carbon” are now the standard units in regulatory and industrial applications, replacing obscure units of measure historically reported by radiocarbon dating laboratories e.g. disintegrations per minute per gram (dpm/g) or radiocarbon age.

The result was obtained by measuring the ratio of radiocarbon in the material relative to a National Institute of Standards and Technology (NIST) modern reference standard (SRM 4990C). This ratio was calculated as a percentage and is reported as percent modern carbon (pMC). The value obtained relative to the NIST standard is normalized to the year 1950 AD so an adjustment was required to calculate a carbon source value relative to today. This factor is listed on the report sheet as the terminology “REF”.

Interpretation and application of the results is straightforward. A value of 100% biobased or biogenic carbon would indicate that 100% of the carbon came from plants or animal by-products (biomass) living in the natural environment and a value of 0% would mean that all of the carbon was derived from petrochemicals, coal and other fossil sources. A value between 0-100% would indicate a mixture. The higher the value, the greater the proportion of naturally sourced components in the material.



Quality Assurance Report

This report provides the results of reference materials used to validate radiocarbon analyses prior to reporting. Known-value reference materials were analyzed quasi-simultaneously with the unknowns. Results are reported as expected values vs measured values. Reported values are calculated relative to NIST SRM-4990C and corrected for isotopic fractionation. Results are reported using the direct analytical measure percent modern carbon (pMC) with one relative standard deviation. Agreement between expected and measured values is taken as being within 2 sigma agreement (error x 2) to account for total laboratory error.

Report Date November 21, 2024

Submitter Alexandra Garner

QA MEASUREMENTS

Reference 1

Expected Value 129.41 +/- 0.06 pMC

Measured Value 129.39 +/- 0.32 pMC

Agreement Accepted

Reference 2

Expected Value 0.44 +/- 0.04 pMC

Measured Value 0.44 +/- 0.04 pMC

Agreement Accepted

Reference 3

Expected Value 95.86 +/- 0.37 pMC

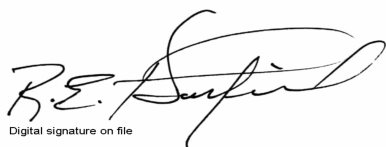
Measured Value 96.45 +/- 0.24 pMC

Agreement Accepted

Comment All measurements passed acceptance tests.

Validation

Date November 21, 2024



Digital signature on file