ISO/IEC 17025:2017-Accredited Testing Laboratory

Beta Analytic, LLC
4985 SW 74th Court
Miami, FL 33155 USA
Tel: (305) 667-5167
info@betalabservices.com

May 8, 2025

Kara Pelissero
ST. MARYS CEMENT INC. (CANADA)
55 INDUSTRIAL ST
TORONTO, Ontario (ON) M4G3W9
Canada

Dear Kara Pelissero,

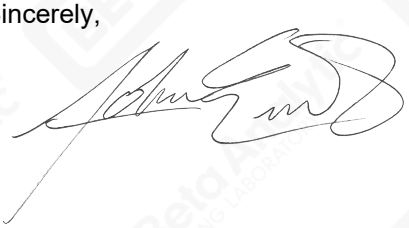
Please find enclosed your radiocarbon (C14) report for the material recently submitted. The result is reported as “% Biogenic Carbon”. This indicates the percentage carbon from “renewable” (biomass or animal by-product) sources versus petroleum (or otherwise fossil) sources . For reference, 100 % Biogenic Carbon indicates that a material is entirely sourced from plants or animal by-products and 0 % Biogenic 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 % Biogenic 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,



John Enriquez
Laboratory Management Group / AMS Chemistry Manager

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Summary of Results - % Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

Validation:

Certificate Number:
D3696A9AA7D5D39E5A69B367CB1F3972

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

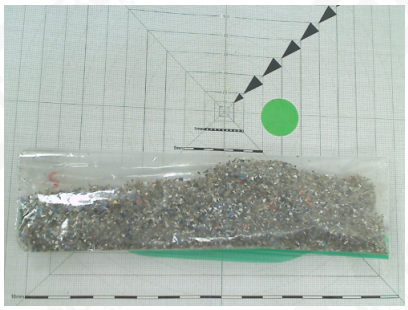
Submitter	Kara Pelissero
Company	ST. MARYS CEMENT INC. (CANADA)
Received Date	May 1, 2025
Report Date	May 8, 2025
Sample Code	April 11 Alt

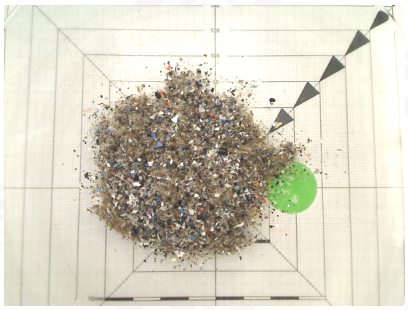
Result

23% Biogenic Carbon Content (as a fraction of total carbon)

Laboratory Number	Beta-748460
Percent modern carbon (pMC)	22.65 +/- 0.12 pMC
Atmospheric adjustment factor (REF)	99.4; = pMC/0.994

Labeling COC


VOC (1mm x 1mm scale)


3040.7mg 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.

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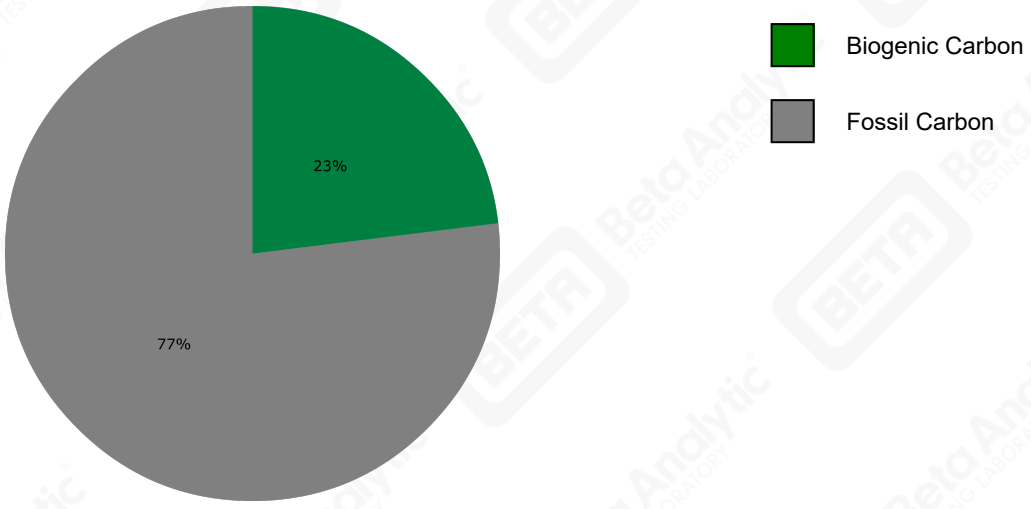

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% Biogenic Carbon Content ASTM D6866-24 Method B (AMS) TC

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-ba sed). 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. disintegra tions 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.

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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.

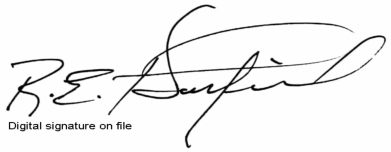
Report Date May 8, 2025

Submitter Kara Pelissero

QA MEASUREMENTS

Reference 1	
Expected Value	0.44 +/- 0.04 pMC
Measured Value	0.44 +/- 0.04 pMC
Agreement	Accepted
Reference 2	
Expected Value	95.86 +/- 0.37 pMC
Measured Value	95.74 +/- 0.24 pMC
Agreement	Accepted
Reference 3	
Expected Value	110.69 +/- 0.40 pMC
Measured Value	110.20 +/- 0.27 pMC
Agreement	Accepted

Comment All measurements passed acceptance tests.

Validation 

Date May 8, 2025