

Determination of Total Organic Carbon or Total Carbon in Geologic Materials by a LECO C744¹ Carbon Analyzer

1. Introduction

Total organic carbon (TOC) is a measure of the organic richness of geologic materials. It is useful as a qualitative measure of petroleum potential. Total Carbon (TC) may also be determined using this method. TOC or TC can be determined by combusting geologic materials to form CO₂ which is detected by a non-dispersive infrared (NDIR) cell. If the TOC content of the material is considered by the submitter to be sufficiently high, additional analyses may be performed on the samples.

2. Interfaces with Other Methods

EGL Method 29, Calibration of Laboratory Scales and Analytical Balances

EGL Work Instruction 11, Acid digestion of powdered sedimentary rocks to remove carbonate minerals

3. Materials and Equipment

1. Samples for analysis
2. Copper Metal Accelerator
3. Iron Chip Accelerator
4. 1 g scoop
5. LECO C744 Carbon Analyzer
6. Analytical Balance
7. Ceramic Crucibles
8. Personal Protective Equipment as Documented in the Chemical Hygiene Plan
9. Oxygen Gas

4. Procedure

1. For TOC follow work instructions for acid digestion to prepare samples for TOC analysis
2. Fold filter paper with sample and place in crucible. Samples for TC analysis are weighed directly into the crucible.
3. Add one gram scoop of copper metal accelerator and one-half gram scoop of iron chip accelerator to each sample.
4. Place crucible(s) on the auto sampler of C744 Carbon Analyzer. Record (or use) the sample order in the log book.

¹ Any use of trade names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Refer to LECO C744 instruction manual for analysis instructions. Instrument conditions can be found on page 9-7 of the instrument manual.

5. Calibration and Quality Control Samples

Digestion blanks using carbonate samples are added to the unknown sample set to ensure the removal of inorganic carbon when analyzing for TOC. Standards are used at the beginning of each analysis set to ensure the calibration is accurate. For TOC analysis, an acid digested rock standard must be run minimally after every ten unknowns as an unknown. For TC analysis rock standards must be run minimally after every ten unknowns as an unknown.

6. Limits, Precautions, and Interferences

According to the instrument manual, the detector's range is 0.002 to 60 mg of total carbon per analysis or 0.02 to 60 wt. % for a 0.1 g sample. The lower detection limit was calculated as 2-sigma deviation of instrument blank measurements according to the manufacturer. Instrument precision is calculated as 1 sigma instrument blank deviation as stated in the instrument manual. It is not the intent of this method to analyze for trace amounts of carbon.

This instrument uses and radiates radio frequency energy and may cause interference to radio communications, thus anything using radio frequency should be kept away from the instrument.

Personal protective equipment must be worn as referenced in the CHP.

Hygroscopic samples should be dried prior to weighing.

Samples rich in carbon should be analyzed at a lower sample weight to avoid flooding the detector.

7. Acceptance of Data

Data are considered acceptable if all standards are within 10% of the accepted value. If standards are not within 10% of the accepted value then analysis must be repeated, including any prep necessary.

8. Data Handling and Transfer

Data values are downloaded from the instrument and put into an Excel spreadsheet. The data are then uploaded into the LIMS.

9. References

Leco C744 Carbon Analyzer Instruction Manual Version 1.85 June 2013

10. Attachments

None.

11. History of Changes

R0: Initial Issue.