

DETERMINATION OF ORGANIC & TOTAL CARBON IN SOILS, SEDIMENTS, AND ON SUBSTRATES, INCLUDING CATALYSTS



Figure 1: Model CM125 TC/TOC Analyzer

PRINCIPLES OF OPERATION

Samples are combusted in an oxygen atmosphere to convert organic and inorganic forms of carbon to CO₂. The combustion temperature is selected (up to 1100°C) either to completely oxidize all carbon forms or to selectively oxidize only the organic carbon forms. The combustion product gases are swept through a barium chromate catalyst/scrubber to ensure that all the carbon is oxidized to CO₂. Other potentially interfering product gases such as SO₂, SO₃, H_x and NO_x are removed from the gas stream in a series of chemical scrubbers. The carbon dioxide is then swept to the CM5017 Carbon Coulometer where it is automatically measured by coulometric titration.

PROCEDURE

1. Assemble and prepare the components for operation as described in the Instruction Manuals.
2. Determine the blank and run a standard to confirm proper operation of the complete system.
3. Weigh a sample into a combustion boat or cup (platinum boats/cups are supplied with the system) and place it in a ceramic boat attached to the Automated Boat Inlet (ABI) hook ladle.

NOTE: The sample size should be selected so the sample contains 1000 - 3000 µg of carbon. Sample weights can range from a few milligrams to several grams. Sample sizes containing above 5 - 10 milligrams of carbon are not recommended for combustion type analysis because of high system pressures.

4. Close the lid of the ABI box. Allow the system to purge for approximately one (1) minute before starting the analysis.
5. Press Begin Analysis on the coulometer and the ABI will automatically move the hook ladle into the combustion zone.
6. When all the CO₂ is evolved and titrated, the CM5017 automatically detects the endpoint, ends the analysis and saves the results on a USB Flash Drive and/or prints the result to the printer*.

(*) – *Endpoint determination and result calculations are performed automatically based on user selectable settings entered in the Parameters section of the CM5017 Carbon Coulometer.*

RESULTS

If sufficient sample has been used to evolve over 1000 µg carbon, the titration accuracy is better than +/-0.15% relative. Overall accuracy then is typically +/-0.3%. When sample availability, volume or reactivity limits the amount of CO₂ evolved to small amounts, the accuracy will be dependent upon sample homogeneity and handling consistency.

NOTES

The UIC, Inc. instrument design is flexible to permit adaptation for specific requirements.

Normal scrubbers remove sulfur oxides, nitrogen oxides and acid halides efficiently enough to analyze carbon in sulfur and mineral acids. Special scrubbers or high capacity scrubbers and tube fillings can be added if needed.

Sample handling provisions are available for samples weighing up to 3-5 grams without major modifications. Special modifications for larger sample sizes can be customized for specific needs. Contact the UIC, Inc for details.

See application note 6 for more detailed information on the determination of carbon in sulfur and application note 12 on volatile sample handling.

For information about the instrument's capabilities, contact the UIC Europe.