

Instrument: TGA801

LOI in Combustion Residues

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Introduction

Thermogravimetric analysis (TGA) is commonly used to determine selected characteristics of materials that exhibit either mass loss or mass gain due to decomposition, oxidation, or loss of volatile materials such as moisture. Macro TGA systems using gram-size samples allow more accurate mass measurements for characterization of heterogeneous materials.

Loss on Ignition (LOI) in combustion residues refers to the mass loss when heated in an air or oxygen atmosphere to a high temperature. In the cement industry, the term LOI refers to a mass loss in a sample heated to 950 °C. LOI values in combustion residue values are used by industries that utilize combustion residues in various processes and products, such as the production of cement, providing a quality parameter.

Sample Preparation

Samples should be a fine powder (-60 mesh).

Accessories

621-331 Large Ceramic Crucibles, 621-011-507 Double Ended Scoop

Sample Mass ~1.0 g

Method Reference

ASTM D7348 Standard Test Methods for Loss on Ignition (LOI) of Solid Combustion Residues

Analysis Time ~3 h

Method General Parameters

Crucible Type	Ceramic
Minimum Crucible Weight	19.0000
Maximum Crucible Weight	30.0000
Crucible Density	3.0
Lid Density	3.0
Sample Type	Other
Sample Density	0.8
Minimum Sample Weight	0.8000
Maximum Sample Weight	1.2000

Method Step Parameters

Step Type	Preset
Preset Method Step	Moisture
Cooling Option	Active
Crucible Lids	No
Start Temperature	25.0 °C
End Temperature	110.0 °C
Ramp Rate	6.0 °C/min
Hold Time	5 min
Maximum Time	180 min
Atmosphere	Nitrogen
Flow Rate	10.0 L/min
Final Weight	At Constancy
Constancy Window	9 min
Constancy Level	0.0005 g

Step Type	Custom
Preset Method Step	Step-1
Cooling Option	Active
Crucible Lids	No
Start Temperature	110.0 °C
End Temperature	500.0 °C
Ramp Rate	6.0 °C/min
Hold Time	5 min
Maximum Time	180 min
Atmosphere	Oxygen
Flow Rate	10.0 L/min
Final Weight	At End Of Step

Step Type	Custom
Preset Method Step	LOI
Cooling Option	Active
Crucible Lids	No
Start Temperature	500.0 °C
End Temperature	950.0 °C
Ramp Rate	8.0 °C/min
Hold Time	0 min
Maximum Time	180 min
Atmosphere	Oxygen
Flow Rate	10 L/min
Final Weight	At Constancy
Constancy Window	9 min
Constancy Level	0.0005 g

Method Step Calculation

Calculation Type Preset
 Preset Method Step Moisture
 Measurement Type Mass Ratio
 Enable Calibration Disabled
 Calculation Equation $((\text{Initial Mass} - \text{Moisture Mass}) \div \text{Initial Mass})$

Calculation Type Custom
 Preset Method Step LOI
 Measurement Type Mass Ratio
 Enable Calibration Disabled
 Calculation Equation $((\text{Initial Mass} - \text{LOI Mass}) \div \text{Initial Mass})$

Calculation Type Custom
 Preset Method Step LOI Dry
 Measurement Type Mass Ratio
 Enable Calibration Disabled
 Calculation Equation $((\text{Moisture Mass} - \text{LOI Mass}) \div \text{Initial Mass})$

Procedure

1. Create and/or select a method using the parameters described above following the procedure in the TGA801 instruction manual.
2. Login and load samples following the procedure outlined in the TGA801 instruction manual.

Typical Results

Sample	Mass (g)	% Moisture	LOI	LOI Dry	Batch*
Fly Ash	1.0038	0.18	2.09	1.91	1
n=10	1.0185	0.19	2.12	1.92	1
	1.0042	0.20	2.10	1.90	1
	1.0028	0.19	2.10	1.92	1
	1.0147	0.16	2.06	1.91	1
	1.0066	0.16	2.14	1.98	2
	1.0062	0.16	2.12	1.97	2
	1.0018	0.14	2.10	1.97	2
	1.0046	0.15	2.06	1.91	2
	1.0155	0.15	2.08	1.93	2
	Avg =	0.17	2.10	1.93	
	s =	0.02	0.03	0.03	

*Dual Furnace TGA801 units were utilized in obtaining results

