



Designation: D8339 – 20

Standard Test Method for The Analysis of Flue Gas Desulfurization Solids by Macro Thermogravimetric Analysis¹

This standard is issued under the fixed designation D8339; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This instrumental test method covers the determination of free moisture, gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), calcium sulfite hemihydrate ($\text{CaSO}_3 \cdot \frac{1}{2}\text{H}_2\text{O}$), calcium hydroxide ($\text{Ca}(\text{OH})_2$), calcium carbonate (CaCO_3), and ash in flue gas desulfurization solids using a macro thermogravimetric analyzer.

1.2 This instrumental test method is not applicable to thermogravimetric analyzers using microgram size samples.

1.3 *Units*—The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[D121 Terminology of Coal and Coke](#)

[D3180 Practice for Calculating Coal and Coke Analyses from As-Determined to Different Bases](#)

[D8146 Guide for Evaluating Test Method Capability and Fitness for Use](#)

[E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods](#)

¹ This test method is under the jurisdiction of ASTM Committee [D05](#) on Coal and Coke and is the direct responsibility of Subcommittee [D05.29](#) on Major Elements in Ash and Trace Elements of Coal.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method](#)

[E1601 Practice for Conducting an Interlaboratory Study to Evaluate the Performance of an Analytical Method](#)

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *flue-gas desulfurization solids, n*—generally are finely divided materials containing various amounts of free moisture.

3.1.1.1 *Discussion*—The origin of the materials is dewatered slurries resulting from the absorption of sulfur dioxide by slurries of lime or limestone fines in a flue gas desulfurization process.

3.1.2 *free moisture, n*—the moisture that evolves from flue-gas desulfurization solids, clay materials, hydrated lime, and similar materials, when they are heated at temperatures ranging from 45 °C to 60 °C until a constant mass is reached.

3.1.2.1 *Discussion*—Free moisture in these materials is not the same as the free moisture in coal, as defined in Terminology [D121](#).

3.2 For definitions of other terms used in this test method, refer to Terminology [D121](#).

4. Summary of Test Method

4.1 In thermogravimetric analysis, the mass of a sample in a controlled atmosphere is recorded repeatedly as a function of temperature or time, or both. *Macro thermogravimetric analysis* (macro TGA) of flue gas desulfurization solids (FGD-Solids) uses a sample mass of approximately 1 g. In a typical analysis, the temperature is normally ramped from ambient to a specific temperature and held at that temperature for a prescribed length of time, and the correspondent specimen mass is repeatedly recorded by the instrument.

4.2 FGD-Solids components: *free moisture, gypsum, calcium sulfite hemihydrate, calcium hydroxide, calcium carbonate*, and *ash* are sequentially determined in a single multi-step heating program. The analysis of a particular component is complete when the specimen reaches a constant mass or at the end of the step.

4.3 *Free Moisture* is determined by measuring the mass loss, caused by evaporating free water from the analysis specimen when heated to 50 °C.