



Standard Practice for Determination of the Six Major Rare Earth Elements in Fluid Catalytic Cracking Catalysts, Zeolites, Additives, and Related Materials by Inductively Coupled Plasma Optical Emission Spectroscopy¹

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1. Scope

1.1 This practice describes the analysis of fluid catalytic cracking catalysts, rare earth exchanged zeolitic materials, additive and related materials when analyzed by ICP-OES for the six most common rare earth elements.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this Practice.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use. See [Appendix X3](#).*

2. Referenced Documents

2.1 ASTM Standards:²

- [C1109 Practice for Analysis of Aqueous Leachates from Nuclear Waste Materials Using Inductively Coupled Plasma-Atomic Emission Spectroscopy](#)
- [D1193 Specification for Reagent Water](#)
- [D3766 Terminology Relating to Catalysts and Catalysis](#)
- [D6299 Practice for Applying Statistical Quality Assurance and Control Charting Techniques to Evaluate Analytical Measurement System Performance](#)
- [D6349 Test Method for Determination of Major and Minor Elements in Coal, Coke, and Solid Residues from Combustion of Coal and Coke by Inductively Coupled Plasma—Atomic Emission Spectrometry](#)
- [D7085 Guide for Determination of Chemical Elements in Fluid Catalytic Cracking Catalysts by X-ray Fluorescence Spectrometry \(XRF\)](#)

Spectrometry (XRF)

- [D7260 Practice for Optimization, Calibration, and Validation of Inductively Coupled Plasma-Atomic Emission Spectrometry \(ICP-AES\) for Elemental Analysis of Petroleum Products and Lubricants](#)
- [D7442 Practice for Sample Preparation of Fluid Catalytic Cracking Catalysts and Zeolites for Elemental Analysis by Inductively Coupled Plasma Optical Emission Spectroscopy](#)
- [E1479 Practice for Describing and Specifying Inductively-Coupled Plasma Atomic Emission Spectrometers](#)
- 2.2 EPA Standard:³
- [Method 6010B Inductively Coupled Plasma-Atomic Emission Spectrometry](#)

3. Terminology

- 3.1 Definitions—see Terminology [D3766](#)
- 3.2 *Definitions of Terms Specific to This Standard:*
 - 3.2.1 ICP-OES—Inductively Coupled Plasma Optical Emission Spectroscopy
 - 3.2.2 FCC—Fluid Catalytic Cracking
 - 3.2.3 Water—Defined as ASTM Type I or highest quality available as defined in Specification [D1193](#).

4. Summary of Practice

4.1 Specimens are prepared using one of the three preparation techniques described in Practice [D7442-08a](#). The result should be a clear, dilute acidic solution suitable for ICP-OES. The final concentration should be 1.0 g of the test specimen prepared and diluted into a 250-mL volumetric flask. The test solutions are introduced into the plasma torch of the ICP instrument where excitation occurs. Characteristic atomic line emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a high resolution grating and the intensities of the individual lines are measured.

¹ This test method is under the jurisdiction of ASTM Committee [D32](#) on Catalysts and is the direct responsibility of Subcommittee [D32.03](#) on Chemical Composition.

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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.

³ Available from United States Environmental Protection Agency (EPA), William Jefferson Clinton Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460, <http://www.epa.gov>.