



Standard Test Method for Determining Activity and Selectivity of Fluid Catalytic Cracking (FCC) Catalysts by Microactivity Test¹

This standard is issued under the fixed designation D 5154; 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 reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers determining the activity and selectivity of either equilibrium or laboratory deactivated fluid catalytic cracking (FCC) catalysts. The activity is evaluated on the basis of weight percent conversion of gas oil in a microactivity unit. The selectivities are evaluated on the basis of weight percent yields of specifically defined products resulting from the catalytic cracking of gas oil.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses are provided for information only.

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.*

2. Referenced Documents

2.1 ASTM Standards:²

- D 2887 Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography
- D 3907 Test Method for Testing Fluid Catalytic Cracking (FCC) Catalysts by Microactivity Test
- D 4463 Guide for Metals Free Steam Deactivation of Fresh Fluid Catalytic Cracking Catalysts
- E 105 Practice for Probability Sampling of Materials
- E 177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods
- E 456 Terminology Relating to Quality and Statistics
- E 691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

¹ This test method is under the jurisdiction of ASTM Committee D32 on Catalysts and is the direct responsibility of Subcommittee D32.04 on Catalytic Properties.

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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.

3.1.1 *activity*—calculated as conversion divided by the difference of 100 minus conversion.

3.1.2 *ASTM reference catalysts*—a set of equilibrium FCC catalysts within the useful range of this test method is used to improve the reproducibility of test results between different laboratories. Each catalyst has a consensus mean conversion value assigned to it by Committee D32. Samples of the ASTM reference catalysts can be obtained through NIST.

3.1.3 *ASTM standard feed*—a specific batch of gas oil that is used as feedstock in the described test method.³

3.1.4 *catalyst/oil (C/O) ratio*—the weight of catalyst used in the test divided by the weight of feed fed to the reactor. In practice, the weight of catalyst is usually maintained at a constant value and the total weight of feed is varied.

3.1.5 *contact time*—calculated as $3600/(\text{WHSV} \cdot \text{C/O})$. This is the delivery time, in seconds, during which feed is introduced to the reactor.

3.1.6 *HCO*—the heavy cycle oil product defined to have a minimum boiling point of 343°C (650°F).

3.1.7 *LCO*—the light cycle oil product defined to have a boiling point range of 216 to 343°C (421 to 650°F).

3.1.8 *measured conversion*—calculated as the difference between the weight of feed used and the weight of unconverted material divided by the weight of feed used times 100 %. The unconverted material is defined as all liquid product with a boiling point above 216°C (42°F).

3.1.9 *normalized product yield*—the result obtained when each product yield has been corrected for non-perfect weight balances. For a run to be judged acceptable, the total recovery, wt % of feed, should be in the range of 96 to 101 % prior to normalization. If the recovery is outside this range the test data should be discarded.

3.1.10 *product yield*—one hundred times the weight of a specific product divided by the weight of feed used in the test.

3.1.11 *reaction severity*—an indication of the severity of the cracking reaction which allows a range of conversions to be obtained from any particular catalyst without changing reactor temperature. Changing reaction severity is achieved by changing WHSV or C/O ratio or both.

³ Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 3460, Gaithersburg, MD 20899-3460.