



Standard Test Method for Determining Activity of Fluid Catalytic Cracking (FCC) Catalysts in a Fluidized Bed¹

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1. Scope

1.1 This test method covers determining the activity and coke selectivity of either equilibrium or laboratory deactivated fluid catalytic cracking (FCC) catalysts. The activity is evaluated on the basis of mass percent conversion of gas oil feed in a fluidized bed reactor. The coke yield is defined as the mass of carbon laid down on the catalyst, also expressed as a percent of the gas oil feed. The scope of the round robin will be limited to the determination of activity and coke. All other analyses are thus beyond this scope and should be noted as “optional.”

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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

D2887 Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography

D4463 Guide for Metals Free Steam Deactivation of Fresh Fluid Cracking Catalysts

E105 Practice for Probability Sampling of Materials

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

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. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *activity*—a measure of the rate of a specific catalytic reaction, calculated in the present case by dividing conversion by the difference of 100 minus conversion.

3.1.2 *catalyst/oil (C/O) ratio*—the mass of catalyst used in the test divided by the mass of feed fed to the reactor.

3.1.3 *coke*—mass of carbon laid down on the catalyst during the FCC reaction times 1.083.

3.1.4 *conversion*—the starting mass of reactant feed minus the mass of the liquid product that boils above 221°C [430°F]; this delta is then reported as a percentage of the starting mass of feed.

3.1.5 *delivery time*—this is the time, in seconds, during which feed is introduced to the reactor.

3.1.6 *FCC*—fluid catalytic cracking.

3.1.7 *gasoline*—C₅ compounds through compounds boiling at 221°C [430°F].

3.1.8 *HCO*—the heavy cycle oil product, which is defined to have a minimum boiling point of 343°C [650°F].

3.1.9 *LCO*—the light cycle oil product, which is defined to have a boiling point range of 221 to 343°C [430 to 650°F].

3.1.10 *liquid product*—all products formed in the catalytic reaction that can be condensed in the chiller bath afterward, usually a combination of gasoline, LCO, and HCO, but can contain a trace of C₄ and C₄ minus compounds.

3.1.11 *normalized product yield*—the result obtained when each product yield has been corrected for non-perfect mass balances.

3.1.11.1 *Discussion*—For a run to be judged acceptable, the total recovery, mass % of feed, should be in the range of 96 to 102 % prior to normalization. If the recovery is outside this range the test data should be discarded.

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

3.1.13 *selectivity*—same as yield. Selectivity generally refers to how much of a particular product, such as coke, is formed during a chemical reaction; selectivity is related to, but