



Designation: D5341/D5341M – 19

Standard Test Method for Measuring Coke Reactivity Index (CRI) and Coke Strength After Reaction (CSR)¹

This standard is issued under the fixed designation D5341/D5341M; 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, patterned after the Nippon Steel test procedure (see Carbonization Research Report 91 and Nishi et al.²), describes the equipment and techniques used for determining lump coke reactivity in carbon dioxide (CO₂) gas at elevated temperatures and its strength after reaction in CO₂ gas by tumbling in a cylindrical chamber referred to as an I-tester.

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 are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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:*³

D346 Practice for Collection and Preparation of Coke Samples for Laboratory Analysis

E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

¹ This test method is under the jurisdiction of ASTM Committee D05 on Coal and Coke and is the direct responsibility of Subcommittee D05.15 on Metallurgical Properties of Coal and Coke.

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² Nishi, T., et al., *Journal of the Fuel Society of Japan*, Vol 61, No. 668, 1982, pp. 1066-1073.

³ 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

2.2 *British Carbonization Research Association Report:*⁴
Carbonization Research Report 91, "The Evaluation of the Nippon Steel Corporation Reactivity and Post-Reaction-Strength Test for Coke."

2.3 *ISO Standard:*⁵

ISO 5725 - 6: 1994 Accuracy of Measurement Methods and Results – Part 6: Use in Practice of Accuracy Values

3. Summary of Test Method

3.1 A sample of dried coke of designated origin and size is reacted with CO₂ gas in a retort at a specified elevated temperature for a specified length of time. Two indices, coke reactivity index (CRI) and coke strength after reaction (CSR), are determined using the reacted coke residue. The mass or weight loss after reaction determines the CRI. The mass or weight retained after sieving the tumbled reacted coke in a designated number of revolutions over a designated turning rate determines the CSR.

4. Significance and Use

4.1 When coke lumps descend in the blast furnace, they are subjected to reaction with countercurrent CO₂ and to abrasion as they rub together and against the walls of the furnace. These concurrent processes physically weaken and chemically react with the coke lumps, producing an excess of fines that can decrease burden permeability and result in increased coke rates and lost hot metal production. This test method is designed to measure indirectly this behavior of coke in the blast furnace.

5. Reagents

5.1 *Nitrogen*, with purity greater than 99.9 % by volume, dry and with total oxygen and carbon dioxide concentrations of less than 100 mg/kg.

⁴ Available from British Carbonization Research Association, Chesterfield, Derbyshire, England.

⁵ Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.