



Standard Test Method for Plastic Properties of Coal by the Constant-Torque Gieseler Plastometer¹

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1. Scope

1.1 This test method covers a relative measure of the plastic behavior of coal when heated under prescribed conditions. This test method may be used to obtain semiquantitative values of the plastic properties of coals and blends used in carbonization and in other situations where determination of plastic behavior of coals is of practical importance.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are 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:

D 2013 Method of Preparing Coal Samples for Analysis²

D 2234 Practice for Collection of a Gross Sample of Coal²

3. Terminology

3.1 Definitions:

3.1.1 *dial division per minute, n*—as used in this test method, a measure of stirrer rotation rate. There are 100 dial divisions for each full 360° rotation of the stirrer. Stirrer rotation rate is total dial divisions turned by the stirrer in a one minute time period.

3.1.2 *final fluid temperature, n*—as used in this test method, the temperature at which stirrer rotation rate last reaches 1.0 dial divisions per minute.

3.1.3 *initial softening temperature, n*—as used in this test method, the temperature at which the stirrer rotation rate first reaches 1.0 dial divisions per minute.

3.1.4 *maximum fluidity, n*—as used in this test method, the measured maximum stirrer rotation rate, in dial divisions per minute.

3.1.5 *maximum fluidity temperature, n*—as used in this test method, the temperature at which stirrer rotation rate reaches a maximum value.

3.1.6 *plastic range, n*—difference between the final fluid and the initial softening temperatures.

3.1.7 *solidification temperature, n*—as used in this test method, the temperature at which the last stirrer rotation is observed.

4. Summary of Test Method

4.1 The plastometer measures the plastic properties of coals by the use of a constantly applied torque on a stirrer placed in a crucible into which the coal is charged. The crucible is immersed in a bath and the temperature increased uniformly. The rates of movement of the stirrer are recorded in relation to increase in temperature.

5. Significance and Use

5.1 Reliable values of the plastic properties of coals are used to predict or explain the behavior of a coal or blends during carbonization or in other processes such as gasification, liquefaction, and combustion.

6. Apparatus

6.1 *Gieseler Plastometer*—The apparatus shall consist of the following:

6.1.1 *Retort*—A steel retort consisting of four parts as shown in Fig. 1.

6.1.2 *Retort Crucible*, cylindrical, 21.4 ± 0.08 mm (0.844 ± 0.003 in.) in inside diameter and 35.0 mm (1.38 in.) in depth, with exterior threads for joining the crucible to the crucible cover. The crucible shall have a 2.38 ± 0.02 -mm (0.094 ± 0.001 -in.) diameter notch in the center of its inside base to serve as a seat for the stirrer.

6.1.3 *Retort Crucible Cover*, with interior threads for joining the crucible cover to the crucible and exterior threads for joining the crucible cover to the barrel. The inside diameter of the hole which accommodates the stirrer is 9.53 ± 0.08 mm (0.375 ± 0.003 in.).

6.1.4 *Barrel*, 121 mm (4.75 in.) long and having an inside diameter of 9.53 ± 0.08 mm (0.375 ± 0.003 in.). The top end of the barrel shall be 12.7 mm (0.500 in.) in inside diameter to a depth sufficient to allow clearance for the axle of the

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² *Annual Book of ASTM Standards*, Vol 05.05.