



Standard Test Methods for Rubber Compounding Material—Zinc Oxide¹

This standard is issued under the fixed designation D 4315; 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 These test methods cover chemical and physical tests for zinc oxide that are considered to be important to its use in rubber compounding.

1.2 The tests appear in the following order:

Test	Section
Zinc Oxide	5
Lead and Cadmium	6
Sulfur	7
Heat Loss	8
Surface Area	9
Sieve Residue	10

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.* For specific precautions, see 5.2.

2. Referenced Documents

2.1 ASTM Standards:

- D 280 Test Methods for Hygroscopic Moisture (and Other Matter Volatile Under the Test Conditions) in Pigments²
- D 1193 Specification for Reagent Water³
- D 3037 Test Methods for Carbon Black—Surface Area by Nitrogen Adsorption⁴
- D 3040 Practice for Preparing Precision Statements for Standards Related to Rubber and Rubber Testing⁵
- D 3280 Test Methods for Analysis of White Zinc Pigments²
- D 4075 Test Methods for Compounding Materials—Flame Atomic Absorption Technique—Determination of Metals⁴
- E 11 Specification for Wire Cloth and Sieves for Testing Purposes⁶

¹ These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and are the direct responsibility of Subcommittee D11.20 on Compounding Materials and Procedures.

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² Annual Book of ASTM Standards, Vol 06.03.

³ Annual Book of ASTM Standards, Vol 11.01.

⁴ Annual Book of ASTM Standards, Vol 09.01.

⁵ Discontinued—see 1986 Annual Book of ASTM Standards, Vols 09.01 and 09.02.

⁶ Annual Book of ASTM Standards, Vol 14.02.

3. Significance and Use

3.1 These test methods may be used for quality control of zinc oxide used as a compounding material and for research and development studies where zinc oxide is used in a rubber mix.

4. Reagents

4.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests.

4.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean Type IV reagent water in accordance with Specification D 1193.

ZINC OXIDE

5. Procedure for Determination of % Zinc Oxide

5.1 Analysis of white zinc pigments is covered in Test Methods D 3280.

5.2 Reagents and safety precautions for Test Methods D 3280 apply.

5.3 Section 6 of Test Methods D 3280 describes the analysis of total zinc in zinc oxide using diphenylamine as internal indicator.

5.4 Section 7 of Test Methods D 3280 describes the analysis of total zinc in zinc oxide using uranyl acetate as external indicator.

LEAD AND CADMIUM

6. Procedure for Determination of Lead and Cadmium in Zinc Oxide

6.1 Test Methods D 4075 is the standard test method for metal analysis in compounding materials using the flame atomic absorption technique. Analysis for cadmium and lead in zinc oxide are described in Sections 11 through 20 of Test Methods D 4075.

SULFUR

7. Procedure for Determination of Sulfur in Zinc Oxide

7.1 Analysis of white zinc pigments is covered in Test Methods D 3280.

7.2 Reagents and safety precautions for Test Methods D 3280 apply.