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Standard Test Method for Conductimetric Analysis of Water Soluble Ionic Contamination of Blasting Abrasives¹

This standard is issued under the fixed designation D4940; 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 describes a procedure for rapid evaluation of abrasives for the presence of ionic contamination by determining the total concentration of water soluble ionic contaminants by means of a conductivity test.

1.2 This test method does not identify the ionic species present nor provide quantitative results on each species.

1.3 This test method is based on a volume comparison among abrasives of similar sizes. A volume comparison is more closely related to surface area of the abrasives than is a weight comparison.

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1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 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

D1193 [Specification for Reagent Water](#)

E832 [Specification for Laboratory Filter Papers](#)

2.2 *Other Standard:*

ISO 11127-6 Preparation of Steel Substrates before Application of Paints and Related Products - Test Methods for Non-Metallic Blast Cleaning Abrasives - Part 6: Determination of Water-Soluble Contaminants by Conductivity Measurement³

2.3 *SSPC: The Society for Protective Coatings*

SSPC-AB 1 [Specification for Mineral and Slag Abrasives](#)⁴

3. Summary of Test Method

3.1 Abrasive and pure water are combined into a slurry that is stirred to leach the soluble salts from the abrasive. This slurry is filtered and conductance of the filtrate is measured. The conductivity, which is related to the concentration of soluble ionic materials contaminating the abrasive surface, is calculated from the conductance and the cell constant.

4. Significance and Use

4.1 By-product abrasives manufactured from slags that are air cooled or quenched with pure water, normally contain low concentrations of ionic materials, as do mined mineral abrasives. However, slags quenched with seawater or other contaminated water, contain high amounts of ionic material as does seashore sand. This contamination of the abrasive can transfer to the steel surfaces being blasted, where it may accelerate corrosion. This test is useful in establishing the cleanliness of the abrasive at the jobsite.

4.2 This test method provides a value that indicates the concentration of total water soluble ions based on their electrolytic mobility. Thus, it provides an indication of ionic corrosion potential.

¹ This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.46 on Industrial Protective Coatings.

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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 Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ Available from Society for Protective Coatings (SSPC), 40 24th St., 6th Floor, Pittsburgh, PA 15222-4656, <http://www.sspc.org>.

NOTE 1—A typical value of conductivity for a high level of contamination is 500 $\mu\text{mho/cm}$. A typical value for a low level of contamination is 50 $\mu\text{mho/cm}$.

5. Apparatus

5.1 *Conductivity Bridge and Cell*—Any commercial conductivity bridge and conductivity cell typically having a range of at least 5 $\mu\text{mho/cm}$ to 10 000 $\mu\text{mho/cm}$ and temperature compensation capability is satisfactory. Either a dip-type, pipet-type, or cup-type cell may be used. A means of adjusting for temperature or controlling the temperature is essential. While some instruments have an adjustment to compensate for temperature (automatic temperature compensation), one means is to use a 25°C constant temperature bath. Another method is to stir the solution with a clean thermometer while the vessel is warmed or cooled by an external source.

NOTE 2—ISO 11127-6 is another method for assessing the level of soluble salt contamination present in an abrasive. It differs from this test method in two major areas:

(1) The ISO method uses a weight to volume ratio between the abrasive and the fluid (deionized water) used to extract soluble salts from the abrasive. The ASTM method allows a user to measure a loose packed volume of abrasive and mix that abrasive with an equal volume of reagent water. The ISO method is well suited to use in a laboratory setting but is poorly suited to use in the field. The ASTM method is well suited for use in the field or laboratory.

(2) The ISO method reports the effect of the level of extracted salts in terms of milliSiemens/m, whereas this test method uses $\mu\text{mho/cm}$. The ISO method uses strict SI units, this test method reports using SI compliant units.

Method to Method Comparison:

The reader is warned that it is difficult to make direct comparisons between the results of these two different methods of analysis.

Weight/Volume versus Volume/Volume Method Considerations:

In the ASTM Method the weight of the abrasive is not known; this makes it impossible to assess the ratio between conductivity values determined using this test method procedure and those determined using the ISO 11127-6 procedure.

Comparisons Between Reported Units for Each Method:

An independent study by SSPC showed that the relative order of extracted salts using each type of procedure on abrasive materials was identical. The ranked order correlation between the two methods was unity. There was no direct correlation possible between numerical results obtained and reported by the two different methods. Abrasives that showed qualifying extracted salts using the ISO Procedure also showed qualifying extracted salt levels as specified in SSPC-AB 1.

Converting from ISO Reported Units to ASTM Reported Units:

Converting from one unit base to another is not useful as the two methods differ in process. The conversion factor from $\mu\text{mho/cm}$ to milliSiemens/m is as follows:

$$\begin{aligned} &\text{A Micro Mho Per Centimetre} \\ &1 \mu\text{mho cm}^{-1} = (1 \times 10^{-6}) \Omega^{-1} \text{ cm}^{-1} \end{aligned}$$

$$\begin{aligned} &\text{A MilliSiemen Per Metre} \\ &1 (\text{MilliSiemen})(\text{m}^{-1}) = (1 \times 10^{-3}) \Omega^{-1} 100 \text{ cm}^{-1} \end{aligned}$$

Thus one milliSiemen/m = ten $\mu\text{mho/cm}$.

5.2 *Filter Paper*, conforming to Specification E832, Type 1, Class C, to keep silt from fouling the surfaces of the conductivity cell.

6. Reagents and Materials

6.1 *Purity of Reagents*—Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society where such specifications are available.⁵ Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

6.2 *Purity of Water*—Unless otherwise indicated, references to water shall be understood to mean reagent water as defined by Type IV of Specification D1193.

6.3 *Potassium Chloride* (KCl or 0.02 N KCl solution).

7. Sampling

7.1 Sampling shall be as follows unless otherwise agreed upon between the purchaser and the seller. Take two 1-L samples of abrasive at random from different packages of each lot, batch, day's pack, or other unit of production in the shipment. When no markings distinguishing between units of production appear, take samples from the different packages in the ratio of two samples for each 5000 kg, except that for shipments of less than 5000 kg, take two samples. Test the samples separately.

8. Calibration and Standardization

8.1 *Determination of Cell Constant:*

8.1.1 The conductivity cell will come with a predetermined constant. This constant should be checked periodically, one method being as follows:

⁵ *Reagent Chemicals, American Chemical Society Specifications*, American Chemical Society, Washington, DC. For suggestions on the testing of reagents not listed by the American Chemical Society, see *Analar Standards for Laboratory Chemicals*, BDH Ltd., Poole, Dorset, U.K., and the *United States Pharmacopeia and National Formulary*, U.S. Pharmacopeial Convention, Inc. (USPC), Rockville, MD.