



Standard Practice for Referencing Test Methods for Chemical Analysis of Metals and Related Materials¹

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1. Scope

1.1 This practice outlines procedures for relating results from test methods to a practical basis, that is, analytical traceability. It explores strategies to ensure the accuracy of a test method and to document reliability of results obtained in individual laboratories.

2. Referenced Documents

2.1 ASTM Standards:

E 882 Guide for Accountability and Quality Control in the Chemical Analysis Laboratory²

E 1601 Practice for Conducting an Interlaboratory Study to Evaluate the Performance of an Analytical Method²

E 2054 Practice for Performance-Based Description of Instruments in Chemical Analysis Methods²

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *analytical traceability, n*—a process relating a measurement or result to a defined chemical basis.

3.1.2 *pure substance, n*—of known purity such that the uncertainty of the sum of impurities has no observable effect on the accuracy of calibration.

4. Significance and Use

4.1 Practice E 1601 covers error to be expected in results obtained from two or more laboratories. Practice E 2054 covers variability expected in results obtained within an individual laboratory. This practice deals with the accuracy of a test method as used within an individual laboratory.

4.2 The information in this practice is to be used to identify suitable reference materials. A standard test method requires reference materials for calibrating instruments or for standardizing reagents. In writing an analytical test method, reference materials are described to emphasize required characteristics, and identify at least one source for uncommon materials. Analysts shall use reference materials specified in test methods in accordance with this practice.

4.3 Procedures from this practice are to be used to verify

that the test method produces acceptable results.

5. Types of Reference Materials

5.1 *Analytical Techniques*—Choice of optimum materials for calibration or standardization depends primarily on the characteristics of the analytical system.

5.1.1 Reference materials of three classes are generally recognized. In nominal order of decreasing quality they are:

5.1.1.1 Certified reference materials, CRMs, having the content of one or more analytes certified by a recognized standardization agency or group,

5.1.1.2 Reference materials, RMs, having the content of one or more analytes accepted for use in calibrating instruments, and

5.1.1.3 Analyzed materials, AMs, having the content of one or more analytes determined by a test method referenced to a pure substance.

5.1.2 This hierarchy often reflects the resources employed in preparing the materials and in establishing their reported values.

5.1.3 For test methods in which samples are presented for measurement as solutions, refer to 5.2. For solid-sample methods, refer to 5.3.

5.2 *Solution-Based Test Methods*—Prepare solutions for calibration of test methods from the analyte, if available as a stable material having a purity of at least 99.9 %. For example, metallic zinc of nominal 99.99 % purity is a preferred reference material for a zinc test method. Metals unaffected by atmospheric oxygen normally require no special preparation, but must be protected from corrosive vapors. For other analytes, use stable compounds of known stoichiometry. For example, reagent grade NaCl is an acceptable reference material for determining sodium or chloride. Reference compounds normally require preparation before use; dry them in air at 100 °C for 1 h, cool in a desiccator, and maintain in a water-vapor-free environment until weighed. Results of test methods of chemical analysis shall be traceable to pure substances that are purchased or prepared in the laboratory. Except for isotopically enriched analytes, calibration materials are expected to be, or be composed of, elements having commonly occurring isotopic ratios.

5.3 *Solids-Based Test Methods*—If possible, prepare solid reference materials for calibration in the same manner and under the same conditions as specified for test specimens. Note

¹ This practice is under the jurisdiction of Committee E-1 on Analytical Chemistry for Metals, Ores and Related Materials and is the direct responsibility of Subcommittee E01.22 on Statistics and Quality Control.

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² *Annual Book of ASTM Standards*, Vol 03.06.