Designation: D7876 – 13

Standard Practice for Practice for Sample Decomposition Using Microwave Heating (With or Without Prior Ashing) for Atomic Spectroscopic Elemental Determination in Petroleum Products and Lubricants[1]

This standard is issued under the fixed designation D7876; 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 practice covers the procedure for use of microwave radiation for sample decomposition prior to elemental determination by atomic spectroscopy.

1.1.1 Although this practice is based on the use of inductively coupled plasma atomic emission spectrometry (ICP-AES) and atomic absorption spectrometry (AAS) as the primary measurement techniques, other atomic spectrometric techniques may be used if lower detection limits are required and the analytical performance criteria are achieved.

1.2 This practice is applicable to both petroleum products and lubricants such as greases, additives, lubricating oils, gasolines, and diesels.

1.3 Although not a part of Committee D02's jurisdiction, this practice is also applicable to other fossil fuel products such as coal, fly ash, coal ash, coke, and oil shale.

1.3.1 Some examples of actual use of microwave heating for elemental analysis of fossil fuel products and other materials are given in Table 1.

1.3.2 Some additional examples of ASTM methods for microwave assisted analysis in the non-fossil fuels area are included in Appendix X1.

1.4 During the sample dissolution, the samples may be decomposed with a variety of acid mixture(s). It is beyond the scope of this practice to specify appropriate acid mixtures for all possible combinations of elements present in all types of samples. But if the dissolution results in any visible insoluble material, this practice may not be applicable for the type of sample being analyzed, assuming the insoluble material contains some of the analytes of interest.

1.5 It is possible that this microwave-assisted decomposition procedure may lead to a loss of "volatile" elements such as arsenic, boron, chromium, mercury, antimony, selenium, and/or tin from the samples. Chemical species of the elements is also a concern in such dissolutions since some species may not be digested and have a different sample introduction efficiency.

1.6 A reference material or suitable NIST Standard Reference Material should be used to confirm the recovery of analytes. If these are not available, the sample should be spiked with a known concentration of analyte prior to microwave digestion.

1.7 Additional information on sample preparation procedures for elemental analysis of petroleum products and lubricants can be found in Practice D7455.

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

1.9 *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.* Specific warning statements are given in Sections 6 and 7.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C1234 Practice for Preparation of Oils and Oily Waste Samples by High-Pressure, High-Temperature Digestion for Trace Element Determinations

C1347 Practice for Preparation and Dissolution of Uranium Materials for Analysis

C1463 Practices for Dissolving Glass Containing Radioactive and Mixed Waste for Chemical and Radiochemical Analysis

D482 Test Method for Ash from Petroleum Products

[1] This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.03 on Elemental Analysis.

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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.

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