Designation: ~~D7482 – 14~~ D7482 – 15

Standard Practice for Sampling, Storage, and Handling of Hydrocarbons for Mercury Analysis[1]

This standard is issued under the fixed designation D7482; 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 types of and preparation of containers found most suitable for the handling of hydrocarbon samples for the determination of total mercury.

1.2 This practice was developed for sampling streams where the mercury speciation is predominantly Hg(0) present as a mixture of dissolved Hg(0) atoms, adsorbed Hg(0) on particulates (for example, carbonaceous or mineral fines and Fe_2O_3) and suspended droplets of metallic mercury.

1.3 The presence of suspended droplets of metallic mercury (often called "colloidal" mercury, since the droplet size can be very small) can make obtaining a representative sample very difficult for a variety of reasons (for example, non-isokinetic sampling of the liquid can result in over- or under-collection of suspended droplets and collection of mercury that has accumulated in dense larger drops and pools on the bottom of piping and in sample taps). Pay strict attention to the detailed procedure (Section 7) to ensure representative samples are collected.

1.4 When representative test portions are collected and analyzed in accordance with acceptable procedures, the total mercury is representative of concentrations in the sample.

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

1.6 **Warning—**Mercury has been designated by EPA and many state agencies as a hazardous material that can cause central nervous system, kidney, and liver damage. Mercury, or its vapor, may be hazardous to health and corrosive to materials. Caution should be taken when handling mercury and mercury-containing products. See the applicable product Material Safety Data Sheet (MSDS) for details and EPA's website (http://www.epa.gov/mercury/faq.htm) for additional information. Users should be aware that selling mercury or mercury-containing products, or both, in your state may be prohibited by state law.

1.7 *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]

D4175 Terminology Relating to Petroleum, Petroleum Products, and Lubricants

D7622 Test Method for Total Mercury in Crude Oil Using Combustion and Direct Cold Vapor Atomic Absorption Method with Zeeman Background Correction

D7623 Test Method for Total Mercury in Crude Oil Using Combustion-Gold Amalgamation and Cold Vapor Atomic Absorption Method

2.2 *EPA Standard:*[3]

EPA Method 1669 Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels; July 1996; US Environmental Protection Agency

[1] This practice is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, 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.

[3] Available from United States Environmental Protection Agency (EPA), Ariel Rios Bldg., 1200 Pennsylvania Ave., NW, Washington, DC 20460 (www.epa.gov).

***A Summary of Changes section appears at the end of this standard**

3. Terminology

3.1 *Definitions*—For definitions of terms used in this standard, refer to Terminology D4175.

3.2 *Abbreviations:*

3.2.1 *VOA*—Volatile Organic Analysis

4. Summary of Practice

4.1 This practice describes the sampling, storage, transport, and handling of hydrocarbon samples used for determining mercury, and the precautions that need to be taken to prevent sample contamination and loss of analyte.

5. Significance and Use

5.1 This practice is intended for use in sampling liquid hydrocarbons including crude oils, condensates, refinery process intermediates, and refined products. Generally these samples are expected to contain mercury from the parts per billion (10^{-9} mass) to parts per million (10^{-6} mass) range.

5.2 This practice is not intended for use when sampling aqueous systems where the concentrations of mercury are often in the parts per trillion (10^{-12} mass) range. These samples are often better addressed by using the rigorously clean techniques from the EPA Method 1669 "clean hands, dirty hands" sampling procedures.

5.3 This practice is not intended for use for liquefied samples, for which special containers may be required for pressurized samples.

5.4 This practice is only suitable for stabilized samples which remain 100 % liquid at ambient conditions. For samples that on depressurization lose some of the light hydrocarbon ends it is important to note that elemental mercury may be lost during sampling. Sampling modules which inject unstabilized liquid hydrocarbons close to process conditions directly to the mercury analyzer can be used to overcome this issue.

5.5 Based on this practice, two Test Methods (D7622 and D7623) are available for determination of mercury in crude oil, based on cold vapor atomic absorption technique.

5.6 In some refined streams and in tank samples free water may be present. Process streams that are water saturated may condense water as the sample cools from process temperature to ambient temperature. Ionic mercury species are water soluble and these water droplets may contain mercury or adsorb mercury over time.

5.7 The presence of mercury during crude oil production, transport, and refining can be an environmental and industrial hygiene concern.

6. Apparatus

6.1 *Clear or Amber Borosilicate Glass,* ~~40-mL~~40 mL or less in volume; pre-cleaned by acid-washing; with PTFE (polytetrafluoroethylene)-lined septum caps. These are commonly referred to as VOA vials and are used for many water samples using EPA methods.

6.1.1 The use of ~~30-mL~~30 mL or smaller VOA vials may allow shipment of multiple sample vials as "excepted quantities" under IATA (International Air Transport Association) regulations. Determine specific shipping requirements with the appropriate knowledgeable personnel.

6.2 *Alternate Containers*—Quartz. Epoxy-lined, tin-lined, or steel cans for direct or sub-sample may not be acceptable because, in some cases, these types of containers show a significant depletion of mercury (see 9.1 and 9.2).

6.2.1 Tin-lined steel cans, direct or sub-sample, are not acceptable.

6.3 *Chain of Custody Forms.*

6.4 *Permanent Marking Pens.*

6.5 *Resealable Bags*—Clear, plastic, ~~1-L~~1 L capacity.

7. Sampling Procedure

7.1 Employ the normal hydrocarbon sampling procedures necessary to obtain discrete and homogeneous samples. Either grab samples or composites from auto-samplers are allowed. Grab samples are preferred. When expecting particulates with adsorbed mercury or mercury droplets, iso-kinetic sampling is greatly preferred.

7.2 Wash the VOA vials with nitric acid, rinse with water, and dry.

7.3 A sample "set" is defined as three VOA glass vials. Each vial is individually wrapped with a plastic bag, and then the set of three vials are overpacked in an appropriate container for transport or shipping. A set of three individually bagged sample vials may be bundled together and placed in a larger bag to separate them from other sample sets included in the same shipment. Adsorbant material may be packed around the bagged vials to further protect against damage during shipping and release of one or more of the sample vials if it ruptures.