



Standard Test Method for Trace Quantities of Carbonyl Compounds with 2,4-Dinitrophenylhydrazine¹

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1. Scope

1.1 This test method covers the determination of total carbonyl in the range from 0.5 to 50 µg calculated as CO.

1.2 This test method is intended to be general and does not include steps for sample preparation.

1.3 Acetals that hydrolyze under the conditions of the test are also determined.

1.4 Carbonyl derivatives such as acetals and imines that are easily hydrolyzed may be determined by an alternative procedure.

1.5 The developed color is not stable and must be measured within a specified period.

NOTE 1—Other test methods for the determination of traces of carbonyl compounds are given in Test Methods D 1089, D 1612, D 2119, and D 2191.

1.6 Review the current appropriate Material Safety Data Sheets (MSDS) for detailed information concerning toxicity, first aid procedures, and safety precautions.

1.7 The values stated in SI units are to be regarded as the standard.

1.8 *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 hazards statements are given in Note 4 and Section 8.

2. Referenced Documents

2.1 ASTM Standards:

D 1089 Test Method for Carbonyl Content of Butadiene²

D 1193 Specification for Reagent Water³

D 1612 Test Method for Acetone in Methanol (Methyl Alcohol)⁴

D 2119 Test Method for Aldehydes in Styrene Monomer⁴

D 2191 Test Method for Acetaldehyde Content of Vinyl Acetate⁴

¹ This test method is under the jurisdiction of ASTM Committee E15 on Industrial and Specialty Chemicals and is the direct responsibility of Subcommittee E15.01 on General Standards.

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² Discontinued; see 1985 *Annual Book of ASTM Standards*, Vol 05.01.

³ *Annual Book of ASTM Standards*, Vol 11.01.

⁴ *Annual Book of ASTM Standards*, Vol 06.04.

E 60 Practice for Molecular Absorption Spectrometric Methods for Chemical Analysis of Metals, Ores, and Related Materials⁵

E 180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial Chemicals⁶

E 300 Practice for Sampling Industrial Chemicals⁶

3. Summary of Test Method

3.1 The sample containing traces of carbonyl compounds is reacted with an acidic solution of 2,4-dinitrophenylhydrazine to form the hydrazone which, upon reaction with potassium hydroxide, forms a wine-red color, presumably due to a resonating quinoidal ion. The intensity of the red color, which is a function of the carbonyl concentration, is determined photometrically and the amount of carbonyl is read directly from a previously prepared calibration curve. This test method is based upon the work of Lappin and Clark.⁷

4. Significance and Use

4.1 This test method is applicable to the determination of trace amounts of aldehydes and ketones in aqueous solutions and a wide variety of organic solvents.

5. Interferences

5.1 This test method has been found to be relatively free from interferences. It is necessary, however, to test a sample to ensure that it does not interfere.

5.2 Carbonyl compounds containing conjugated unsaturation interfere by absorbing at a different wavelength than other carbonyl compounds.

5.3 Acetals that are only partially hydrolyzed under the conditions of the test will interfere. A higher reaction temperature is required to effect complete hydrolysis.

5.4 Certain carbonyl compounds such as diisobutyl ketone have been found to undergo incomplete reactions and thus give low results. These compounds may be determined if a suitable calibration is made using the compound in question.

5.5 Because of the extreme sensitivity of this test method, it is necessary to perform the test in a room from which acetone or other carbonyl compound vapors are excluded.

⁵ *Annual Book of ASTM Standards*, Vol 03.05.

⁶ *Annual Book of ASTM Standards*, Vol 15.05.

⁷ Lappin, G. R., and Clark, L. C., *Analytical Chemistry*, Vol 23, 1951, p. 541.