



Standard Test Method for Determination of Free Formaldehyde in Emulsion Polymers by Liquid Chromatography¹

This standard is issued under the fixed designation D5910; 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 is used for the determination of free formaldehyde (HCHO) in emulsion polymers without upsetting existing formaldehyde equilibria. The procedure has been evaluated using acrylic, acrylonitrile-butadiene, carboxylated styrene-butadiene and polyvinyl acetate emulsion polymers. This test method may also be applicable for emulsion polymers of other compositions. The established working range of this test method is from 0.05 to 15 ppm formaldehyde. Emulsion polymers must be diluted to meet the working range.

1.2 This test method minimizes changes in free formaldehyde concentration that can result from changes in the physical or chemical properties of an emulsion polymer.

1.3 There are no known limitations to this test method when used in the manner described. The emulsion polymer test specimen must be prepared with a diluent that has a pH similar to that of the emulsion. Use of an inappropriate pH may upset formaldehyde equilibria and result in incorrect formaldehyde levels.

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

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 D01.33 on Polymers and Resins.

Current edition approved Nov. 1, 2012. Published November 2012. Originally approved in 1996. Last previous edition approved in 2005 as D5910 – 05. DOI: 10.1520/D5910-05R12.

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.

D2194 Test Method for Concentration of Formaldehyde Solutions

E180 Practice for Determining the Precision of ASTM Methods for Analysis and Testing of Industrial and Specialty Chemicals (Withdrawn 2009)³

E682 Practice for Liquid Chromatography Terms and Relationships

3. Summary of Test Method

3.1 The aqueous phase of an emulsion polymer is diluted and chromatographed on a reversed-phase octadecyl silane (ODS) column using an aqueous mobile phase and a visible-light detector at 410 nm. Formaldehyde is separated from other species in the matrix on a chromatographic column. The detection system includes a post-column reactor that produces a lutidine derivative when formaldehyde reacts with the 2,4-pentanedione reagent (Nash Reagent). The concentration of free formaldehyde in emulsion polymers is determined using peak areas from the standard and sample chromatograms. This test method is specific for formaldehyde.

4. Significance and Use

4.1 With the need to calculate free formaldehyde levels in emulsion polymers, it is necessary to make the determination without upsetting any equilibria that might generate or deplete formaldehyde. This test method provides a means for determining ppm levels of free formaldehyde in emulsion polymers without upsetting existing equilibria.

5. Interferences

5.1 This test method is very selective for formaldehyde. Potential interferants are either chromatographically separated from formaldehyde or do not react with the post-column reagent.

NOTE 1—The following species were identified as possible interferences for the method: acetaldehyde, acetone, benzaldehyde, formamide, formic acid, glyoxylic acid and propionaldehyde. These species, when chromatographed using this test method, did not interfere with the formaldehyde peak at the 1000 ppm level or lower.

³ The last approved version of this historical standard is referenced on www.astm.org.