Phenols - 4-Aminoantipyrine Method

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Applications and Industries

Domestic and industrial wastewater, surface water, drinking water, saline water, disinfection solutions

Wastewater treatment plants, citrus fruit disinfection

References

APHA Standard Methods, 23rd ed., Method 5530 D – 2010

USEPA Methods for Chemical Analysis of Water and Wastes, Method 420.1 (1983)

ASTM D 1783-01, Phenolic Compounds in Water, Test Method B

Chemistry

In an alkaline solution, phenol and other phenolic compounds react with 4-aminoantipyrine to produce a red colored complex. The color forming reaction is initiated by potassium ferricyanide (ampoule tip coating). This chemistry detects ortho- and meta-substituted phenols in addition to phenol. Under certain pH conditions, phenols substituted in the para position with a carboxyl, halogen, hydroxyl, methoxyl, or sulfonic acid group may be measured. Parasubstituted phenols substituted with an alkyl, aryl, nitro, benzoyl, nitroso, or aldehyde group (e.g. paracresol) do not typically develop color with this chemistry. Results are expressed in ppm (mg/L) “equivalent phenol” as C_6H_5OH. Because 4-aminoantipyrine reacts with less sensitivity with substituted phenols than with phenol itself, test results represent the minimum concentration of phenolic compounds in the sample.

Storage Requirements

Products should be stored in the dark, at room temperature and in a low-humidity environment.

Shelf Life

When stored in the dark, at room temperature and at low humidity:

Visual colorimetric:

CHEMets and VACUettes refills, color comparators: at least 1 year

Instrumental colorimetric:

Vacu-vials kits: at least 1 year

Available Analysis Systems

Visual colorimetric: CHEMets®, VACUettes®

Instrumental colorimetric: Vacu-vials®

Interference Information

- Although the ideal sample pH is 7-9, sample pHs between 4 and 10 are well tolerated. Sample pHs below 3 may cause the reagent to precipitate and may overcome the buffering capacity of the reagent, causing low test results.
- Ferrous iron interferes, often causing a blue precipitate to form in the sample after the ampoule tip coating is dissolved, or by resulting in a blue-green color development.
- Calcium may cause the reagent to precipitate. Addition of a few drops of 1% EDTA solution to the sample can minimize interferences from iron and calcium.
- Sulfide at concentrations >100 ppm may interfere, sometimes causing a yellow turbidity.
- Sulfur dioxide and other reducing agents may interfere.
- Hydrogen peroxide at up to 0.5% does not interfere.
- Permanganate and chlorine interfere.
- Unexpectedly high test results can be caused by contaminated labware, including a sample cup that was previously used with a highly contaminated sample. In order to remove this contamination, labware can be rinsed with a dilute sulfuric acid solution followed by several rinses with distilled water.
- Sample color or turbidity may make a color match difficult during visual colorimetric testing and may cause a false positive result with instrumental colorimetric tests. A chemical zero can be used during instrumental analysis to minimize this interference. To generate a chemical zero, completely remove the tip coating from an ampoule by dissolving it in water; discard the water. Snap this ampoule in sample and wait 1 minute, then use this ampoule to zero the photometer. Alternatively, CHEMetrics’ Sample Zeroing Accessory Pack can be used to correct for potential errors during instrumental analysis.
- Highly contaminated wastewaters may require distillation to separate phenols from non-volatile impurities.

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Accuracy Statement

Statements of accuracy are based on laboratory tests performed under ideal testing conditions using standards of known concentration prepared in deionized water.

CHEMets and VACUettes kits: ± 1 color standard increment

K-8003 Vacu-vials kit:

≤ 0.10 ppm at 0 ppm
± 0.12 ppm at 0.40 ppm
± 0.40 ppm at 2.00 ppm
± 0.60 ppm at 6.00 ppm

K-8023 Vacu-vials kit:

≤ 0.25 ppm at 0 ppm
± 0.3 ppm at 1.0 ppm
± 1.2 ppm at 6.0 ppm
± 1.5 ppm at 15.0 ppm

Safety Information

Safety Data Sheets (SDS) are available upon request and at www.chemetrics.com. Read SDS before using these products. Breaking the tip of an ampoule in air rather than water may cause the glass ampoule to shatter. Wear safety glasses and protective gloves.

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