

ACIDITY OF ACETONE

UOP Method 809-84

SCOPE

This method is for determining the acidity of acetone as acetic acid from 500 mass-ppm down to a lower detection limit of 10. The acidity can also be expressed as mg of KOH/g.

OUTLINE OF METHOD

The pH of 50 mL of water is preadjusted with 0.05-*M* sodium hydroxide to a phenolphthalein end point, a faint but perceptible pink color, in a 250-mL Erlenmeyer flask. A 50-mL sample of acetone is pipeted into the flask and the stirred solution is titrated with 0.01-*M* sodium hydroxide to the same perceptible pink color originally obtained. Acidity is calculated as mass-ppm acetic acid or as mg of KOH/g from the volume of the titrant used in the titration of the sample.

APPARATUS

Buret, 10-mL, 0.05-mL subdivisions

Flask, Erlenmeyer, 250-mL

Flask, volumetric, 100-mL

Cylinder, graduated, 50-mL

Pipet, 50-mL

Stirring apparatus, Sargent-Welch Scientific, Cat. No. S-76491-10, or equivalent, with Teflon coated stirring bar

REAGENTS AND MATERIALS

All reagents shall conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society, when such specifications are available, unless otherwise specified. Unless otherwise indicated, references to water shall be understood to mean reagent water conforming to Type IV of ASTM D 1193 CO₂ free.

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Isopropyl alcohol, 99% minimum purity, Sargent-Welch Scientific, Cat. No. SC 14354-500ML, or equivalent

Phenolphthalein indicator, dissolve one gram of phenolphthalein in isopropyl alcohol and dilute to 100 mL with the alcohol

Sodium hydroxide standard solution, aqueous, 0.01-*M*. Prepare from the solid or a concentrate. Standardize by any acceptable procedure, e.g., potassium hydrogen phthalate.

Sodium hydroxide, 50 mass-% aqueous solution

PROCEDURE

Measure into a 250-mL Erlenmeyer flask 50 mL of water with a graduate.

Add 0.5 mL of phenolphthalein indicator and titrate with 0.01-*M* sodium hydroxide to a faint but perceptible pink color. While stirring at a moderate rate, pipet 50 mL of the acetone sample into the flask. Continue stirring and titrate with 0.01-*M* sodium hydroxide dispensed from a 10-mL buret to the perceptible pink color originally obtained.

The relative density can be measured using ASTM D 4052 or other accepted techniques.

CALCULATIONS

Calculate the acidity of the acetone as follows:

$$\text{Acidity, as acetic acid, mass-ppm} = \frac{0.0012 VM 10^6}{D}$$

$$\text{Acidity, as mg KOH/g of sample} = \frac{1.12 VM}{D}$$

where:

D = relative density of the sample at the sampling temperature

M = molarity of the sodium hydroxide

V = volume of 0.01-*M* sodium hydroxide used to titrate the sample, mL

0.0012 = 0.060/50, millimolecular weight of acetic acid divided by the sample volume

1.12 = 0.056(1000)/50, millimolecular weight of potassium hydroxide multiplied by a grams-to-milligrams conversion factor and divided by the sample volume

10⁶ = conversion factor from mass-% to mass-ppm

PRECISION

Based on 6 replicate determinations, the estimated standard deviation (esd) for acidity at the 20 mass-ppm level was calculated to be 0.55 mass-ppm. Duplicate results by the same operator should not differ by more than 2.03 mass-ppm (95% probability) at the stated level.

TIME FOR ANALYSIS

The elapsed time for a single analysis is 1.0 hour. The labor requirement is 0.25 hour.

REFERENCE

ASTM method D 4052, www.astm.org

SUGGESTED SUPPLIER

Sargent-Welch Scientific Co., 7300 N. Linder Ave., Skokie, IL 60077