Total Hardness – EDTA Method

7/10/2024, Ver #1

Applications and Industries

Drinking water, surface water, saline water

References

APHA Standard Methods, 23rd ed., Method 2340 C - 1997. USEPA Methods for Chemical Analysis of Water and Wastes, Method 130.2 (1983).

According to the USGS, the general classification guidelines of waters are:

- 0 to 60 mg/L (milligrams per liter) as calcium carbonate is classified as soft;
- 61 to 120 mg/L as moderately hard;
- 121 to 180 mg/L as hard;
- more than 180 mg/L as very hard.

Chemistry

In an alkaline solution, ethylenediaminetetraacetic acid (EDTA) forms a chelated soluble complex with calcium and magnesium ions. Calmagite, the endpoint indicator, has a red color in the presence of excess calcium and magnesium and a blue color when calcium and magnesium are complexed. Results are expressed as ppm (mg/L) calcium carbonate ($CaCO_3$). To convert test results from ppm to grains per gallon, divide by 17.16.

Available Analysis Systems

Titrimetric: Titrets®

Storage Requirements

Products should be stored in the dark and at room temperature.

Shelf Life

When stored in the dark and at room temperature:

Titrets kit: at least 1 year

Accuracy Statement

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

Due to the non-linear nature of the test scale, the accuracy of these tests varies with the location of the test result on the scale. At twice the minimum concentration for a particular kit range, the accuracy is ± 10% error.

K-4502: ± 0.4 ppm at 4 ppm
K-4520: ± 4 ppm at 40 ppm
K-4585: ± 20 ppm at 200 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 when a valve assembly is not attached may cause the glass ampoule to shatter. Wear safety glasses and protective gloves.

Interference Information

1. Polyphosphate and various metal ions, including aluminum, barium, cadmium, chromium, cobalt, copper, iron, lead, manganese (Mn+2), nickel, strontium, and zinc, may interfere by causing fading or indistinct endpoints or by causing a false positive test result.
2. Suspended or colloidal organic matter may interfere with the endpoint.
3. Titration should be performed without significant hesitation in order to minimize the tendency toward calcium carbonate precipitation.
4. Analysis should be performed at or near room temperature, as the endpoint color change becomes impractically slow as temperatures approach freezing, and the indicator may decompose in hot water.

Interpretation of Results

At the endpoint of this titration, the color of the solution in the test ampoule changes from blue to pink. If the ampoule is filled with sample but the color of the solution remains blue (i.e. does not change to pink), the total hardness concentration is below the test range. If the solution in the ampoule changes to pink immediately upon introduction of the first small dose of sample, the total hardness concentration is above the test range.