O·I·Analytical

# Method Abstract

**Summary:** The primary ions that contribute to water hardness are calcium(II) and magnesium(II). Ions of other elements such as strontium, iron, aluminum, zinc, and manganese also add to water hardness, but their concentrations are generally negligible relative to those of calcium and magnesium. The magnesium disodium salt of ethylenedinitrilotetraacetic acid (Mg-EDTA) exchanges the magnesium for calcium on an equivalent basis. The free magnesium that is present in the sample plus the magnesium displaced from the Mg-EDTA reacts with calmagite, buffered at pH 10. This reaction produces a red-violet complex, and the absorbance is measured at 520 nm. The results are expressed as weight of calcium carbonate ($CaCO_3$) per volume.

**Interferences:** There are no significant interferences. Filter turbid samples prior to determination.

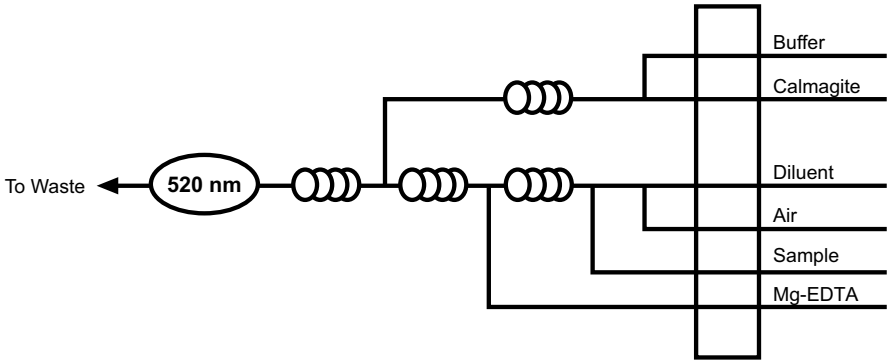
**Performance Specifications:**

| | |
|---|---|
| Range: | 30–400 mg/L $CaCO_3$ |
| Throughput: | 60 samples/hour |
| Precision: | |
| 30 mg/L | <5% RSD |
| 75 mg/L | <2% RSD |
| 200 mg/L | <1% RSD |
| 400 mg/L | <1% RSD |
| Method Detection Limit (MDL): | 2.0 mg/L $CaCO_3$ |
| | |
| Range: | 5–100 mg/L $CaCO_3$ |
| Throughput: | 60 samples/hour |
| Precision: | |
| 5 mg/L | <3% RSD |
| 20 mg/L | <2% RSD |
| 50 mg/L | <1% RSD |
| 100 mg/L | <1% RSD |
| Method Detection Limit (MDL): | 0.5 mg/L $CaCO_3$ |

**Chemicals:**

Ammonium Chloride, $NH_4Cl$
Ammonium Hydroxide, 28–30% as $NH_3$, $NH_4OH$
Brij®-35, 30% w/v (OI Analytical Part #A21-0110-33)
Calmagite, $C_{17}H_{14}N_2O_5S$
Ethylenedinitrilotetraacetic Acid, Magnesium Disodium Salt, $(NaO_2CCH_2)_2NCH_2CH_2N(CH_2CO_2)_2Mg$
Hydrochloric Acid, concentrated, HCl
Methyl Red Indicator Solution, 0.1% w/v

**Basic Flow Diagram:**



**Selected References:**

*Methods for Chemical Analysis of Water and Wastewater;* EPA-600/4-79-020; U.S. Environmental Protection Agency, Office of Research and Development, Environmental Monitoring and Support Laboratory: Cincinnati, OH, 1984; Method 130.1.

*Standard Methods for the Examination of Water and Wastewater*, 20th ed.; American Public Health Association: Washington, D.C., 1998.





*(800) 653-1711*
*(979) 690-1711*
*www.oico.com*
*oimail@oico.com*