

# **Total Hardness Titration**

**Marvin Palmer  
United States Environmental Protection Agency  
Great Lakes National Program Office  
Region 5  
77 West Jackson 9th Floor  
Chicago, Illinois 60604**

**July 1994**



# Total Hardness Titration

## 1.0 Background

Hardness of water is a measure of the total concentration of the calcium and magnesium ions expressed as calcium carbonate.

In this procedure, a water sample is buffered to pH 10.1 and indicator is then added to the buffered sample. The indicator, when added to a solution containing Ca and Mg ions, turns red. EDTA, the titrant, complexes with Mg and Ca cations, removing them from association with the indicator. When all the Mg and Ca are complexed with EDTA, the indicator will turn blue.

The analysis must be performed on the mid depth sample during unstratified conditions, and on the mid-epilimnion and mid hypo-limnion sample when stratification is present.

## 2.0 Procedure

- 2.1 A 100 mL water sample is measured into a plastic beaker containing a stirring bar. The water should be at room temperature, so it is easiest to use the water warmed for specific conductance measurement.
- 2.2 A 1 mL volume of buffer solution is added to the stirred water. This buffer solution is found in the small bottle marked "Buffer Solution Hardness 1".
- 2.3 One packet of indicator "ManVer 2 Hardness Indicator Powder Pillows" is added to the buffered sample. A red color will result. From this point, no more than five minutes should elapse to the end of the analysis to prevent CaCO<sub>3</sub> formation.
- 2.4 While stirring, the sample is titrated with 0.01M EDTA solution until the sample turns blue (no tinge of red remains).
- 2.5 The volume of titrant is marked on the "board sheet."
- 2.6 The titrated sample, with a pH of approximately 10, is discarded into a holding container for future neutralization.
- 2.7 Calculations: Total Hardness; mg/L as CaCO<sub>3</sub> = 10 x mL of titrant.
- 2.8 These reagents and chemicals can be obtained from Hach Chemical Company and are described in Standard Methods for the examination of Water and Wastewater, 14th Edition.

