Alternative Alkalinity Determination (P1/P2 Method) Instruction Sheet

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The P1/P2 back-titration method was mainly developed in an attempt to overcome the limitations of the P_f/M_f alkalinity method. The P1/P2 method eliminates the interference in the "M" titration.

EQUIPMENT

The following equipment and material is necessary for the P1/P2 alkalinity testing:

Hydrochloric acid solution, standardized N/50 (0.02 normal)
Sodium hydroxide solution, 0.1 normal (N/10)
Barium chloride solution, 10 percent, neutralized to pH 7 with Na OH
Phenolphthalein indicator solution, 1g/100 cm^3
pH paper strips, 1-11
Titration dish
Volumetric pipette (TD), 1ml x .001 ml
Volumetric pipette 5 ml x .1 ml
Burette automatic student type, 25 ml
Graduated cylinders, 25 ml, 10 ml
Stirring rod

PROCEDURE

1. Determine the P_f alkalinity using the P-M method.

2. Using a pipette, measure 1.0 cm^3 of filtrate into the titration dish.

3. Using a 5cc pipette, add 2.0 ml of 0.1 normal (N/10) sodium hydroxide solution and stir well. Measure the pH with the high range pH paper (or pH meter). If the pH is less than 11.4, add exactly 2.0 ml more of 0.1 normal sodium hydroxide solution. Exact measurement of the sodium hydroxide is necessary to avoid serious errors. Proceed to Section III, 2.4.

4. Using the 10 ml graduated cylinder, measure 3 cm^3 of barium chloride solution and add to the titration vessel. Add 2-4 drops of phenolphthalein indicator solution while stirring.

CAUTION

DO NOT USE YOUR MOUTH TO PIPETTE THE BARIUM CHLORIDE SOLUTION. IT IS EXTREMELY POISONOUS.

5. Immediately titrate the mixture with the standard 0.02 normal hydrochloric acid to the first disappearance of the pink color (or to a pH of 8.3 with a pH meter). The color may reappear after a short time; however, do not continue the titration.

RESULTS

1. Report the alkalinity, P1, as the cm^3 of 0.02 normal acid to reach the phenolphthalein endpoint.

2. Determine a blank alkalinity, P2. Repeat the procedure described in the "PROCEDURE" section and Step 1 above for determining P1, using exactly the same quantities of water and reagents in preparing the sample.

3. Report the blank alkalinity, P2, as the cm^3 of 0.02 normal acid needed to titrate the reagent mixture to the phenolphthalein endpoint.

REMARKS

1. The procedure given in the previous paragraphs is intended to reduce the major interferences in the P_f/M_f alkalinity test, and thus provide a better estimate of hydroxyl, carbonate, and bicarbonate concentrations. Calculating these concentrations does not make them true values; the composition is theoretical, based on water chemistry carbonate equilibriums.

2. Within the limitations outlined, the various ionic concentrations can be calculated as followed:

   When P1 > P2

   OH^-, mg/L = 340 (P1 - P2)

   CO_3^{-2}, mg/L = 1200 [P_f - (P1 - P2)]

   When P1 < P2

   HCO_3^-, mg/L = 1220 (P2 - P1)

   CO_3^{-2}, mg/L = 1200P_f

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