CALCIUM CARBONATE IN TOPSOIL (NEUTRALIZATION POTENTIAL OF TOPSOIL)

(An Arizona Method)

1. SCOPE

1.1 This test method is used to determine the acid-consumption capacity or alkalinity of a topsoil as defined by the conditions of the test itself. The principal mineral components of the topsoil which give rise to this alkalinity are generally taken to be alkali and alkaline earth metal carbonates. They are represented by calcium carbonate, the most abundant member of the group.

1.2 A large excess of Hydrochloric Acid Standard Solution is added to ensure complete decomposition of the Calcium Carbonate. Then, the residual acid is backtitrated out with Sodium Hydroxide Standard Solution.

1.3 This test method involves hazardous material, operations, or equipment. This test method does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user to consult and establish appropriate safety and health practices and determine the applicability of any regulatory limitations prior to use.

1.4 See Appendix A1 of the Materials Testing Manual for information regarding the procedure to be used for rounding numbers to the required degree of accuracy.

2. APPARATUS

2.1 Requirements for the frequency of equipment calibration and verification are found in Appendix A3 of the Materials Testing Manual. Apparatus for this test procedure shall consist of the following:

2.1.1 25 mL, volumetric pipette, accurate to $\pm$ 0.05 mL.

2.1.2 A balance or scale capable of measuring the maximum weight to be determined and conforming to the requirements of AASHTO M 231, except the readability and sensitivity of any balance or scale utilized shall be at least 0.01 gram.

2.1.3 Filter paper equivalent to Whatman No. 40.

2.1.4 Filtration funnel, 7.5 cm, 60°, long stem.

2.1.5 300 mL beaker, tall form, graduated.

2.1.6 25 mL burette, accurate to $\pm$ 0.01 mL.

2.1.7 Stirring rod (glass or plastic).

3. REAGENTS

3.1 1.00 $\pm$ 0.10 Normal Hydrochloric Acid Standard Solution. Label this solution "Reagent 1" or "R_1" on the bottle. This reagent is available from laboratory chemical suppliers as a standardized solution. Its normality should be checked regularly against "Reagent 2" below, as required by frequency of use. Record the actual normality of this solution as "N_1".

3.2 1.00 $\pm$ 0.10 Normal Sodium Hydroxide Standard Solution. Label this solution "Reagent 2" or "R_2" on the bottle. This reagent is available from laboratory chemical suppliers as a standardized solution. Its normality should be checked regularly against primary standard Potassium Biphthalate, as required by frequency of use. Record the actual normality of this solution as "N_2".

3.3 Phenolphthalein Indicator (1% Phenolphthalein in 50% Isopropyl Alcohol).

3.4 Demineralized Water.

4. PROCEDURE

4.1 Weigh 1.00 $\pm$ 0.01 gram of soil passing a No. 12 sieve into a 300 mL beaker.

4.2 Pipette 25.00 $\pm$ 0.05 mL Hydrochloric Acid Solution (Reagent 1) into the 300 mL beaker.

4.3 Stir thoroughly with a stirring rod.

4.4 Let the mixture stand undisturbed for 15 minutes, or, if significant bubbling is observed, 30 minutes.

4.5 Filter the entire contents of the 300 mL beaker into another 300 mL beaker and rinse three times with demineralized water, being careful to keep the total volume at or under 100 mL.

4.6 Dilute to 100 mL, if necessary, with demineralized water, and add one drop of Phenolphthalein Indicator.

4.7 Backtitrate the residual Hydrochloric Acid with Sodium Hydroxide Solution (Reagent 2) to a Phenolphthalein endpoint.

4.8 Record the volume of Reagent 2 delivered, to the nearest 0.05 mL, as "V_2".

5. CALCULATIONS AND REPORT

5.1 Calculate Calcium Carbonate, in percent, using the following formula:

$$\text{Calcium Carbonate, \%} = 5 \times \left[25 - \frac{N_2 \times V_2}{N_1} \right] \times N_1$$

5.2 Report Calcium Carbonate to the nearest 0.1%.