

**84-007 BARIUM ACETATE CEC of Organic Soils****1. Application**

- 1.1 This AOAC method is the preferred method for CEC of organic soils. It yields somewhat higher values than the ammonium acetate method.

**2. Apparatus**

- 2.1 250 mL Erlenmeyer flasks.  
2.2 Reciprocating shaker.  
2.3 Whatman #41 filter paper.  
2.4 Large flasks to contain final washings.  
2.5 Large funnels.

**3. Reagents**

- 3.1 0.5 N Hydrochloric acid (conc. HCl 42 mL/L).  
3.2 Prepare a 0.5N solution of barium acetate ( $\text{Ba}(\text{OAc})_2$  63.86 g/L).  
3.3 Prepare a 1% solution of silver nitrate ( $\text{AgNO}_3$  1g/100 mL).  
3.4 Prepare a 0.1N solution of sodium hydroxide (NaOH 4g/L).  
3.5 Prepare a solution of acid potassium phthalate (4.0846 g/200 mL). Oven dry the acid potassium phthalate at 120°C before making the solution.  
3.6 Phenolphthalein indicator solution (1 g/100 mL of 95% Ethyl alcohol).

**4. Procedure****4.1 Extraction**

- 4.1.1 Weigh 2.0 g of 2 mm air dry soil in a 250 mL Erlenmeyer flask. Use 0.5 g for organic soils.  
4.1.2 Add 50 mL of 0.5N HCl, stopper the flasks and shake on a reciprocating shaker for 30 minutes.  
4.1.3 Filter through Whatman #41 filter paper in a large funnel.  
4.1.4 Wash with 100 mL portions of  $\text{H}_2\text{O}$  until 10 mL wash shows no precipitate with 3 mL 1%  $\text{AgNO}_3$ . Discard the filtrate.

- 4.1.5 Immediately transfer sample to 250 mL Erlenmeyer flask by puncturing the filter paper and washing the sample through the funnel with a fine spray from a wash bottle containing 0.5N Ba(OAc)<sub>2</sub>. Add a total of 100 mL.
- 4.1.6 Shake flask for 15 minutes on a reciprocating shaker.
- 4.1.7 Filter and wash the sample with three successive 100 mL portions of distilled water. Save the washings and discard the sample.

#### 4.2 Titration

- 4.2.1 Standardize the 0.1N sodium hydroxide solution by titrating against 10 mL of the acid potassium phthalate solution. This gives the true normality of the sodium hydroxide solution.
- 4.2.2 Titrate the washings with 0.1N NaOH to first pink using 5 drops of phenolphthalein, as indicator.

### 5. Calculations

$$5.1 \quad \text{CEC meq/100 g} = \frac{\text{mL} \times \text{Normality of NaOH} \times 100}{\text{g sample}}$$

### 6. Precision

- 6.1 In the LRRRI analytical service lab the coefficient of variation at a CEC level of 166 meq/100 g is 1.6%.

### 7. References

- 7.1 AOAC (Association of Official Agricultural Chemists) 1975. Methods of Analysis. pp. 32 and 246.
- 7.2 MacLean, A.J., Halstead, R.L., Mack, A.R. and Jasmin, J.J. 1964. Comparison of procedures for estimating exchange properties and availability of phosphorus and potassium in some eastern Canadian organic soils. Can. J. Soil Sci. 44, 66-75.