Procedure for Determining the Specific Surface Area of Soil or Clay Samples by EGME Method

A. Sample Pre-drying:

1. Weigh and record the weight of each oven-dried empty weighing bottle.

2. Weigh ~ 1.1 g sample of soil in weighed weighing bottle. Spread the sample evenly over the bottle bottom.

3. Place the weighed bottles with samples in a vacuum desiccator over about 250 g of P_2O_5.

4. Evacuate the desiccator using a vacuum pump for one hour, close the stopcock, and dry the sample to constant weight. Record the weight of P_2O_5-dried sample.

B. Preparation of $CaCl_2$-EGME (ethylene glycol monoethyl) solvate:

1. Weigh ~ 120 g of 40-mesh $CaCl_2$ into a 1-L beaker and dry in an oven at 210ºC for one hour or more to remove all the traces of water.

2. Weigh 20 g, or 21.5 ml of EGME and put it into a 400 ml beaker.

3. Remove the $CaCl_2$ from the oven, weigh out 100 g without cooling, and add it to the beaker containing the EGME. Mix immediately and thoroughly with a spatula.

4. After the $CaCl_2$-EGME solvate has cooled, transfer it to a glass vessel and spread it uniformly over the bottom. Store the vessel contents in a sealed desiccator.

C. Sorption of EGME by Soil Sample:

1. Wet the soil sample, P_2O_5-dried to constant weight, with approximately 3 ml of EGME to form a soil or clay-adsorbate slurry.

2. Place the weighing bottles containing the sample-adsorbate slurry into a vacuum desiccator containing anhydrous $CaCl_2$ on the bottom of the desiccator.

3. Transfer the vessel with the $CaCl_2$-EGME solvate into the same vacuum desiccator, containing the weighing bottles with soil samples.

4. Allow 30 min or more for the sample – solvate slurry to equilibrate.

5. Evacuate the desiccator with a vacuum pump for about 1 hour.

6. Allow the desiccator to stand at room temperature for 4 or 6 h, release the vacuum, open the desiccator and close each weighing bottle with cap to prevent the sample from adsorbing atmospheric water.

7. Weigh each weighing bottle with sample and record the weight.

8. Return each weighing bottle to vacuum desiccator with the cap removed.

9. Repeat step C5 to C8 until constant weight is attained.

D. Specific surface area calculation:

1. Calculate the specific surface area by the equation:

$$A = \frac{Wa}{(Ws * 0.000286)}$$

Where:

A = specific surface area in m^2/g,

Wa = weight of EGME retained by the sample in g,

Ws = weight of P_2O_5-dried sample in g,

0.000286 is the weight of EGME required to form a monomolecular layer on a square meter of surface.