

Soil mechanics II
CIVIL ENGINEERING VIRTUAL LABORATORY
Experiment no 4 Determination of total soluble solids

OBJECTIVE

To determine the total soluble solids in soils by Gravimetric Method.

THEORY

The presence of water soluble solids in soil can be determined by gravimetric method.

For an extract of Soil-Water mix (1:10 ratio), the soluble solids are determined as below:

Total soluble salt A (%) = $B/10 \times 100 = 10B$

Where, A=Total soluble solids (%)

B=Mass of residue (g) after evaporation of 100 cc of extract containing 10 g of soil solids.

APPARATUS USED

- i) Evaporating Dish-2 Nos. each of 100 ml capacity made of silica, Porcelain or glass
- ii) Steam bath
- iii) Buchner funnel or filter candle
- iv) Electric stirrer i.e. shaking machine
- v) Vacuum pump, pipette, Desiccator
- vi) Balance accurate to 0.0002 g.
- vii) Electric oven

PROCEDURE

- i) Put the clean evaporating dish in the electric oven and heat it upto 180 degree C for 1 hour. Cool in the desiccator, weigh and keep it in the desiccator.
- ii) Keep about 50 g of soil collected from the field for oven drying at 103 degree C temperature for about 14 hours. After taking the soil out of the oven, cool it and then sieve it through 2 mm sieve. Transfer 50 g of 2 mm soil to the

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dispersion cup and fit it with the electric stirrer. Pour 500 ml distilled water in the cup containing the soil sample.

iii) Agitate the soil-water mixture with the help of electric stirrer for about 1 hr. All the soluble salts, present in the soil thus get dissolved in 1:10 solution

iv) Allow the solution in dispersion cup to settle for about 10-12 hour. Decant thereafter, the supernatant liquid into a tall 750 ml glass cylinder. Insert a filter candle in the cylinder and connect it with a 1 lt flask through a rubber tube and start filtering by applying suction to the flask. Discard the first 25-30 ml of filtrate collected in suction flask by stopping suction process. Reconnect the suction system with the flask and collect the remaining filtrate and preserve the same for analysis.

The soil extract may also be filtered through a Buchner funnel. Reject the first 25-30 ml of the filtrate and collect the rest into a dry flask.

Take out the evaporating dish from desiccator.

v) Fill the 100 ml pipette with filtrate and transfer the same into the evaporating dish. Now keep this dish over a steam bath very carefully. Evaporate the filtrate in the dish to dryness at about 98 degree C to avoid boiling and then kept it for cooling for 1-2 hours.

vi) Take the dish out of the oven and cool the residue and weigh.

OBSERVATIONS AND CALCULATIONS

Calculate the percentage of the soluble salts as:

$$\text{Total soluble salt A (\%)} = \frac{B}{10} \times 100 = 10B$$

Where, A = Total soluble solids (%)

B = Mass of residue (g) after evaporation of 100 cc of extract containing 10 g of soil solids.

PRECAUTIONS

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- 1) Due to constant use, fine dispersed clay particles stick on the outside of the candle filter. To remove it, take the candle out of the suspension and gently blow air into the filter candle by means of rubber tube connection.
- 2) The surface of the candle can be cleaned by rubbing with a sand a paper lightly.
- 3) During drying of filtrate, in the evaporating dish the temperature of the oven should not be kept above 98 degree C in order to avoid the boiling of the sample.

REFERENCES

Soil Testing for Engineers

QUIZ

- 1) What are the sources of the soluble salts present in the soil?
- 2) What is temperature range values while drying the filtrate?
- 3) While filtering the soil extract, why we are rejecting the first 25-30 ml of the filtrate?