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Experiment No-6: Determination of calcium carbonate content in calcareous soils

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Theory

Percentage of calcium carbonate, CaCO_3 (%), is defined as the total carbonates which is contained in 100 g of dry soil. We express total carbonates, (CaCO_3 , MgCO_3 etc) as CaCO_3 .

Principle

The determination of CaCO_3 (%) is based on the volumetric analysis of the carbon dioxide CO_2 , which is liberated during the application of hydrochloric acid solution HCl in soil's carbonates and is described with the following reaction:



During the application of the acid into the soil sample a foaming is observed, evidence of carbon dioxide's liberation and the existence of carbonate salts consequently.



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Reagents :

Methyl orange indicator: Dissolve 50 mg methyl orange sodium salt in 100 ml H_2O , which contain 15, 2 ml of HCl 0,01 N solution. Mild heat the solution, and when it gets cold an infiltration follows.

Calcimeter Bernard filling solution: Dissolve 200 g $CaCl_2 \cdot 6H_2O$ in 100 ml distilled water, add 3 drops methyl orange indicator and some drops of non-concentrated solution of hydrochloric acid till the solution becomes red-orange.

Solution of HCl_4 N: Dilute 340 ml concentrated HCl with distilled water up to 1000 ml.

Instrument- Calcimeter Bernard



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Procedure:

Weigh 200 g of prepared soil sample and transfers it into the Bernard apparatus conical flask.

Afterwards fill the glass of the apparatus till the $\frac{3}{4}$ of its height with HCl 4 N solution and place it into the conical flask attentively. Pay attention, that the tubule stays upright with the acid (Solution of $\text{HCl}_4 \text{ N}$) inside.

Cap the conical flask with its particular plug and then make zero the level of the filling solution. With the left hand bring the pear shaped glass container next to the graduated column for the fluids both in the pear shaped container and in the graduated tube stand in the same level.

With the right hand, shake gently the conical flask, so, the HCl 4N solution comes in contact with the prepared soil sample.

Then CO_2 liberated. The filling solution of graduated column descends due to the pressure of liberated CO_2 .

At the same time, we lower the pear shaped container for its fluid level to remain in the same level with the fluid of the column. This way the hydrostatic pressure equalizes.

When the liberation of the CO_2 is finished, stop the agitation and note the column's reading.



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Calibration

The determination of the correction factor f of the instrument is as follow: Weigh about 0.10 g CaCO_3 , which has been dried at 104°C , transfer it into the Bernard apparatus conical flask and follow the same process as described above

$$f = W \times T / 1.22 \times V$$

Where : W = g weighted CaCO_3

T = temperature of measurement, in K V = ml produced CO_2



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Observation: Students must complete your calculation with above formula and write proper conclusion

Sample No	CaCO ₃ content (%)	Remark
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1.		
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2.		
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3.		
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