Electro and Physico Chemical Properties of Indian Alluvial Sandy Loam

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With 1 Figure

Summary

The electro- and physico-chemical studies of Indian (Agra) sandy loam soil reveal that the clay mineral present in it is mainly illites.

Introduction

X-ray, differential thermal, optical, electrometric and viscometric methods have been suggested for identifying and characterising the clayminerals in soils. Considerable investigations of clay minerals have been made by BELYANKIN[1]), SEDLETSKY[2]), J. N. MUHERJEE and R. P. MITRA[3]) and B. CHATTERJEE[4]). Titration curves showing the relation between the pH and milliequivalents of added NaOH have been studied by C. E. MARSHALL[5]) and MUKHERJEE[6]). MUKHERJEE and MITRA[7]) observed that the character of the clay mineral, its concentration and the base used for titration affect the nature of the titration curves.

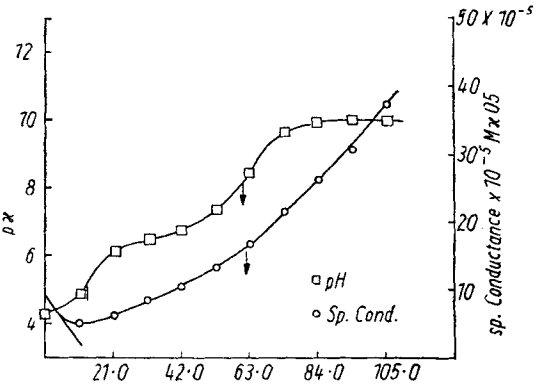

Fig. 1. H-Clay Fraction of Agra Sandy Loam—M. E. of NaON added/100 gms of H-Clay

[1]) BELYANKIN, Comp. rend. acad. Sci. URSS **18**, 673 (1938).
[2]) SEDLETSKY, Acad. Sci. URSS 121 (1941).
[3]) J. N. MUKHERJEE and R. P. MITRA, J. Coll. Sci. **1**, 141 (1946).
[4]) B. CHATTERJEE, J. Ind. chem. Soc. **12**, 81 (1949).
[5]) C. E. MARSHALL, J. physic. Chem. **46**, 1077 (1942).
[6]) J. N. MUKHERJEE, loc. cit.
[7]) J. N. MUKHERJEE and R. P. MITRA, J. physic. Chem. **47**, 543 (1943).

B. CHATTERJEE[8]) studied the nature of clay minerals in sakrand soil (Sind) which was saline in character. He observed by determing its chemical composition and potentiometric titration of the H-Clay that the mineralogical characteristics of the clay o fraction corresponds to the illites.

In this paper, we communicate the results of the electro chemical titrations of the hydrogen clay of an Indian soil which is a Sandy Loam with a view to have an information of the clay mineral present in it. The physicochemical properties of the soil has also been studied.

Experimental

The soil sample was collected near 736 mile on Agra Bombay road (India). It was dried, powedered and sieved. Mechanical analysis was done by the ROBINSONS Method[9]) Organic carbon was determined by WALKLEY and BLACKS[10]) method. pH was determined using cobridge pH meter. Clay was seperated by following the method of ROBINSON as outlined by WRIGHT[11]), and was fused by fusion with sodium carbonate.

The hydrogen clay was prepared by leaching 2.0, microns fractions of the soil with 0.02 N HCl and then washing free from chloride.

Potentiometric as well as conductometric titrations were done. Increasing amounts of the alkali were added to a fixed volume of the hydrogen clay sol (containing 5 gms of the hydrogen clay per litre) taken in each of several pyrex glass bottles provided with ground glass stoppers. Water was added to make the total volume same in each. The mixture weres kept overnight and their pH and conductivity were determined on the following day.

Discussions

The potentiometric curve shows one weak inflexion point at pH 5.2 and another sharp inflexion at pH 8.3. The base exchange capacities at the first and second inflexion points are 11 and 61 m. e. of NaOH. The conductometric curve also shows two points of intersections.

The nature of the curve resembles with that of illite obtained by MARSHALL and KRIMBILL[12]). The SiO_2/R_3O_3 for the clay fraction of Agra Sandy Loam is 2,47 also corresponds to that of illite as the silica sesquioxide ratio for illite lies between 2 and 3 as calculated from the tables given by E. R. GRIM[13]). The base exchange capacity of the clay fraction of the sandy loam is 45 m. e. which is slightly greater then the range given for illites (10—40 m. e.) which also shows that Agra sandy loam consists of illite mixed with some minerals or its transformation products.

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[8]) B. CHATTERJEE, J. Ind. Chem. Soc. **13**, 268 (1950).
[9]) Tech. Comm. Bull. Soil Soc. Harpenden **26** (1933).
[10]) WALKEY and BLACK, Soil. Sci. **37**, 29 (1934).
[11]) WRIGHT, Soil analysis, Thomson Murby and Co. London (1939).
[12]) C. E. MARSHALL and KRIMBILL, J. physic. Chem. **46**, 1077 (1942).
[13]) R. E. GRIM, Clay mineralogy, Mc. Graw Hill book company INC, page 372 (1953).

Observation

Physico-Chemical Properties of the Soil

Liquid Limit	24.88
Plastic Limit	17.32
Plastic Index	7.56
Sticky Point	28.28
Clay %	9.36
Silt %	19.84
Sand %	70.80
Porespace	45.30
pH	7.9
Conductivity	$5.320 \cdot 10^{-3}$ mhos.
Shrinkage Limit	24.00
Shrinkage ratio	1.68
Volumetric shrinkage	10.08
Carbon %	0.414
Loss on Ignition %	5.779

Chemical Composition og H Clay of the Soil

SiO_2 %	35.215
Al_2O_3 %	16.520
Fe_2O_3 %	9.04
SiO_2/R_2O_3	2.47
SiO_2/Al_2O_3	3.26
SiO_2/Fe_2O_3	10.38
B. E. C.	45 m. e.

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