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EFFECT OF INDUSTRIAL WASTES ON CLAY MINERALS : XRD AND SEM ANALYSIS

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ABSTRACT

Clay minerals containing amended soil samples were collected at upper surface from the GIDC, Vapi near Heranba and GIDC, Ankaleshwar near GIL. The samples were precipitated & concentrated by centrifuge method for the extraction of clay X-Ray Diffraction (XRD) and Scan Electron Microscopy (SEM) analysis were carried out for these clay seperates quartz (Silica), illite and kaolinite minerals while smectite was found in traces.

Beside the above analysis we have also carried out physico-chemical analysis of the same soil sample.

Key Words : Clay minerals, Amended soil, X-Ray Diffraction (XRP), Scan Electron Microscopy (SEM), Physico-chemicals analysis, GIDC Vapi, GIDC Ankaleshwar.

INTRODUCTION

Clay is an important soil constituent that controls its properties and also influences its management and productivity. Moreover, clay have a large specific area that is mostly negatively charged and these sites retain nutrients like K^+ and NH_4^+ ions and adsorb many toxic elemerits. In addition clays contain K^+ and Mg^{2+} ions that the amount of clay in a soil have a very important bearing on the genesis and physical and chemical properties of soils.

GIDC Vapi and Ankleshwar are highly industrialised areas of Asia. In both the areas chemicals, fertilizers, pesticides, textiles, dyes, pharmaceuticals etc. industries are running. The waste being ponded to open spaces or rivers to sea. Therefore the ponded area are being contaminated[1] by organic & metallic species. Such contaminations alter the soil physical and chemical properties. In view of the above it has been considered worthwhile to study the effect of industrial wastes on soil clay minerology by using XRD and SEM.

MATERIAL AND METHODS

Different industrial waste amended soil samples ware collected at upper horizon the GIDC, Vapi and GIDC, Ankaleshwar in polythene bags and brought to the laboratory. Samples were air dried, grind and sieved through > 2 um and stored in glass bottles for further study.

Table 1. General characteristics and minerals observed by XRD- analysis

Sr.No.	Site of Sample Collection	General Characterstics.	Main Minerals Observed.
1	Amended Soils from GIDC, From Vapi near Heranba Insecticide Ltd.	Horizon 0-20 cm P^H = 8.12 EC = 2800 umhos	Quartz Kaolinite little Smectite
2	Amended soils From GIDC, Ankaleshwar near Gujarat Insecticide Ltd. (GIL)	Horizon 0-20 cm P^H = 8.10 EC = 2400 umhos	Quartz Kaolinite Illite

Table 2. Physico chemical charecteristics (ug/gm) of amended soils

Sr.No.	Parameters	Amended soil From GIDC Vapi near Haranba Ltd. Insecticide Ltd.	Amended soil from GIDC Ankaleshwar near Gujarat Insecticide Ltd.(GIL)
1	CO_3^{-2}	12	14
2	HCO_3^-	113	73
3	Cl^-	532	3325
4	SO_4^{-2}	2329	1246
5	Total-Alkali	1.2	1.44
6	Ab. P	0.587	0.90
7	T-P	3.22	1.17
8	NO_3^-	0.44	4.29
9	Ex-Ca	320.64	160.32
10	Ex-Mg	68.221	48.729
11	Oraganic Matter	25.911	7.816
12	COD	14	5.71

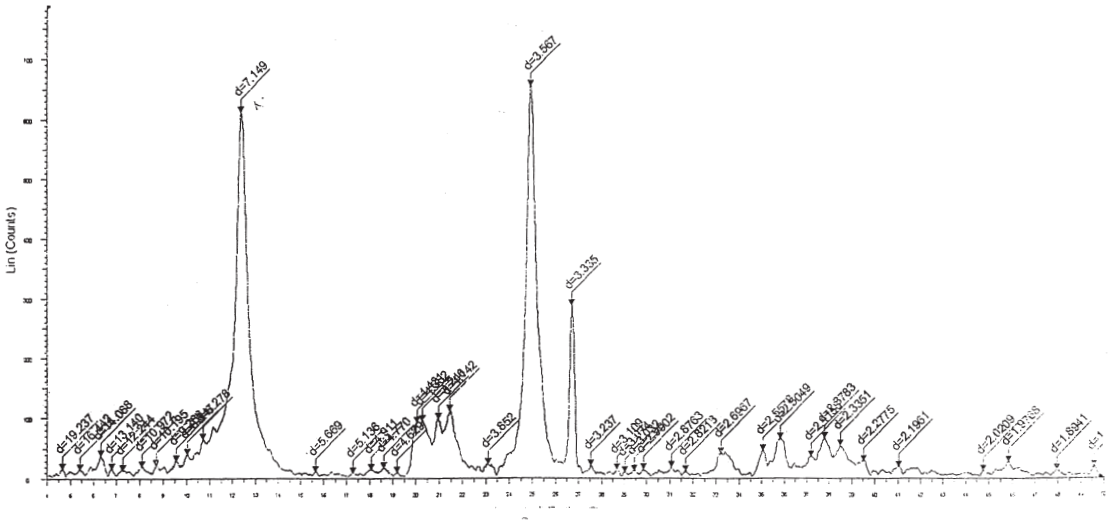


Fig. 1. Representative XRD diagram of the < 2 m fraction of the Surface horizon (10-20 cm.) of the Amended Soil, G.I.D.C., Vapi

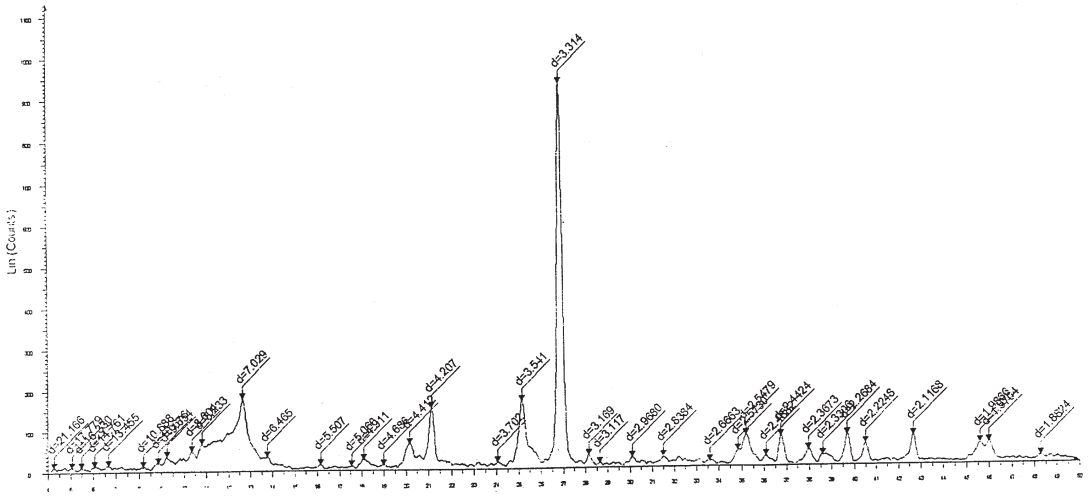
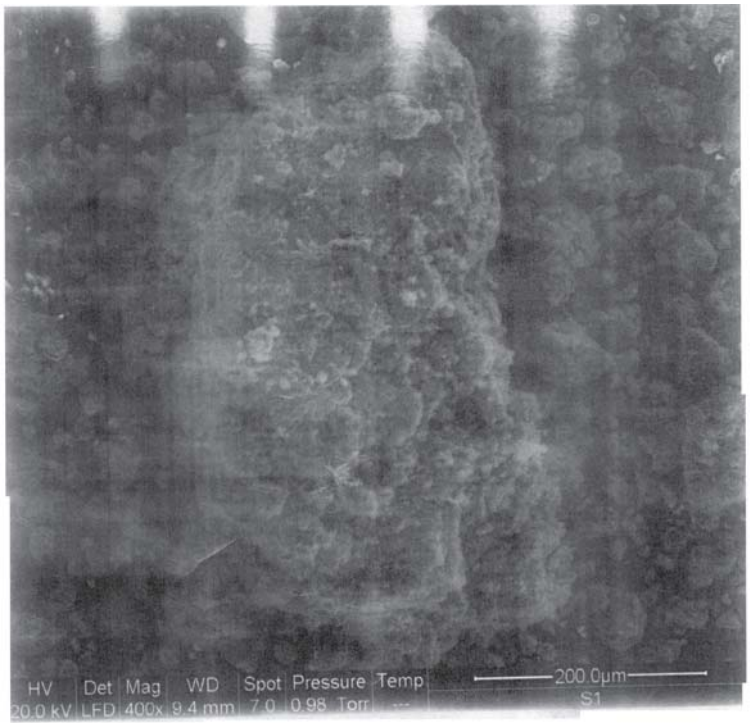


Fig. 2. Representative XRD diagram of the < 2 m fraction of the Surface horizon (10-20 cm.) of the Amended Soil, G.I.D.C., Ankaleshwar.



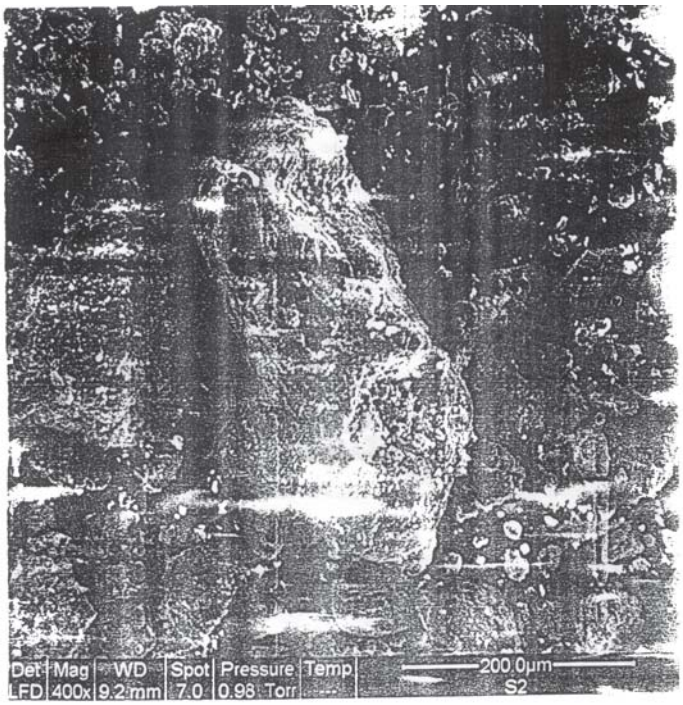


Fig. 3. Representative XRD diagram SEM photographs 1] Surface horizon Amended Soil, G.I.D.C., Vapi. 2] Surface horizon Amended Soil G.I.D.C., Ankaleshwar.

50 gram of fine powdered soil sample was taken in one litre measuring cylinder and add one litre of distilled water through mechanical shaking for 30 minutes kept this measuring cylinder over night next day taken out suppermant liquid with the help of a pipette into a plastic bottles. Above liquid Samples were concentrated by centrifuge at 2500 rpm for ~ 10 minute. The centrifuge (i.e. concentrated) samples were stored in glass bottles. Seperated clay fraction on the slide were analysed using XRD and SEM. Evalution of clay minerology of the samples was then carried out.

RESULTS AND DISSCUSSION

The results obtained during the course of this study are given in tables (1-2) and XRD diffractogram and SEM photographs are being presented in the figures1-3.

The XRD results indicates that the main constituents of these clays are Quartz, kaolinite and little smectite and Illite. The scan of clay extract from all samples are the more or less similar, are shown in figure 1 and 2.

Kaoline minerals can be formed by neosynthesis from the product from the products of hydrolytic decomposition of feldspars and other primary minerals[2-3] and by conversion of smectite or vermiculite to kaolin following by dexyinterlayering in the expandeble mineral or mixed layering between 2:1 and 1:1 layers[4-6].

The Scan of soil clay extracts of both the samples is more or less similar and shown in figure 3. Both diffractogram show a broad quartz peak centered from 3.31- 3.54 2°O. A sharp asymmetric peak at about 9,178, 2° O and a slightly asymmetric kaolinite peak was observed at 7.0 - 7.149 2° O, using the Diffrac Plus software were fitted to the pattern, one is for quartz and kaolinite and two in the region of light reflection. A slightly asymetric peak spacing of 4.207, 2° O, and much more asymmetric peak with its maximum range of escaping from the 8.951 °-9.6 2° O.

The presence of minerals in soils is a results of both inheritance and anthigenic formation of minerals. Several comprehensive reviews[7-9] indicate that there is not many examples that can claim to show how to for minerology have proven or likely influence in soil genesis an managment. A search for links between minerology and soil properties of agricultural importance is likely to be difficult because likely many a times the description of minerals actually present lin a soil is inadiquate or incomplete[10] Minerals present in soil intluences of soil.

Scanning Electron Microscopy (SEM) :

Beside the XRD analysis of the samples we have scanned two clay samples which was extracted from industrial waste amended soils. Upper horizon amended soil was taken for the study. The arrangement of partical size average of the obtain liquid phase was in fig. 3 shows the microscopy tipical clay partical size from upper soil properties. We are different spacing, in the same crystal conforming the presence of quartz, kaolinite, little smectite & illite minerals. These results also demostrate the goodness of particle size seperation method.

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