

Characterisation Studies of Corbyn's Cove Beach Soil in Andamann Nicobar Islands

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Abstract - The qualitative identification of minerals in coastal soil samples of a Corbyn's Cove beach in Andamann and Nicobar islands has been reported. The elemental composition and morphology of atmospheric particles were investigated using SEM-EDAX system. The EDAX spectrum shows the presence of dominant elements such as chloride, oxygen, sodium and also other minerals such as silica, alumina, magnesium, calcium, titanium, manganese are present in trace amounts. SEM picture of coastal soil sample was taken at 20 Kv with different magnification and it depicts platy flakes and spongy structure of the soil. The submicron sized particles seem to have a rough coarse and rough morphology. Random distribution of shapes like square, and rhombohedra had been observed.

Keywords — *Andamann and Nicobar Islands, Corbyn's Cove beach, Coastal soil, EDAX, Minerals, SEM*

I. INTRODUCTION

Soil is a mixture of inorganic and organic solids, air and water. Soil chemistry involves the chemical reactions and processes between these components and particularly focuses on investigating the fate of contaminants and nutrients within soils. (Nyle et al., 1996) The arrangement and organization of primary and secondary particles in a soil mass is known as soil structure. Soil structure controls the amount of water and air present in soil. Plant roots and germinating seeds require sufficient air and oxygen for respiration. Bacterial activities also depend upon the supply of water and air in the soil. Soil structure influences rather indirectly by formation of an array of pores of various shapes and sizes. These pores are controlling factors governing water, air and temperature in soil.

Geologically, two sedimentary series are known in Andamanns, the Port Blair and the archipelago in the Andamanns, besides altered igneous intrusions of volcanic rocks. The Port Blair series consists principally of non-calcareous grey sand stone and imbedded shales, with occasional nests of poor coal, conglomerates and pale grey lime stones. The archipelago series consists of soft lime stones formed of coal and shell sand, soft calcareous sand stones and white clay with occasional conglomerates. Volcanic fragmentary rocks apparently younger appear in the Port Blair series. A turbulent ten degree channel separates Andamanns from the Nicobars which are spread

over 300 kilometers and comprise of 19 islands out of which 7 are uninhabited, the Nicobars are contrastingly different from the Andamanns. In fact, these islands are the most inaccessible from the mainland India. Generally, the soil structure prevalent in the villages of the Nicobar group of islands is porous coral.

The mineral analysis will give a prompt area of research and give an important tool in economic scale also. In this Present study, it is decided to carry out the qualitative determination of the Macro and Micro Constituent minerals present in the Coastal soil samples. So, the soil sample is collected from Corbyn's Cove beach in Andamann Nicobar Islands and taken for our study of interest. There are number of methods are used to identify the minerals by the conventional techniques such as Energy Dispersed X-ray Spectroscopy (EDAX) and Scanning Electron Microscopy (SEM).

EDAX is an X-ray Spectroscopic method for determining elemental compositions. It is an elemental analysis and using EDAX the presence of elements can be identified. The EDAX, popularly known as Energy Dispersive spectroscopy technique, is used for identification of different elements present in the sample. Therefore, this can be used for studying the composition of the sample.

We can analyze the chemical components in a material under SEM. It is also known as SEM analysis or SEM microscopy, is used very effectively in microanalysis and failure analysis of solid inorganic materials. Election

microscopy is performed at high magnification generates high resolution images and precisely measures very small features and objects.

II. EXPERIMENTAL METHODS

A. Collection of Samples

The soil samples were collected from Corbyn’s Cove beach (Figure.1and Figure.2) in Andamann and Nicobar islands.100 grams of seashore soil sample was collected in one feet depth from the surface in a clean polyethylene container.

B. Sample Preparation

The soil samples were dried, milled and sieved out particles of ≤ 1 mm by drying at 60°C for three days in an oven to remove moisture. The dried soil was crushed and sieved and then stored in sterile, closed glass bottles for further investigation.

C. SEM-EDAX (Scanning Electron Microscopy-Energy Dispersed X-ray Spectroscopy) Analysis

Quantitative and elementary analysis of soil samples were characterized by SEM-EDAX instrument (VEGA3TESCAN). The morphological features of dried soil samples are coated with fine carbon layers to improve the secondary electron signal to enable or improve the images of samples in the SEM. Fine carbon layers are being transparent to the electron beam and conductive in X-ray microanalysis.

electrical voltage around 10 keV for characterization of metals and other trace elements. The weight percentage of each element in the spectrum was identified. On the normalization to 100% for Carbon and Oxygen the weight percentage of different elements were also identified.



Figure.1 Study Area



Figure.2 Andamann and Nicobar Islands

III. RESULTS AND DISCUSSION

Environmental concerns have social, political and economic implications, both locally and globally. Environmental Chemistry involves the chemical interactions between humans and nature. The chemical properties and reactions of natural and man-made substances greatly influence how we live – from what we eat, to how we travel around. Human activities impact on chemical processes in the environment, therefore environmental scientists aim to monitor, detect and resolve problems that humans have created in nature.

Environmental pollution is an undesirable change in air water and land. Pollution of soil environment like coastal area due to industrial wastes and other wastes. It is an important problem faced by the developed as well as developing countries.

Soil is a mixture of inorganic and organic solids, air and water. Soil chemistry involves the chemical reactions and processes between these components and particularly focuses on investigating the fate of contaminants and nutrients within soils. Knowledge of soil chemistry allows scientists to monitor, control and predict the effects of pollutants in the environment. Chemical knowledge combined with understandings from the Earth sciences, physics and biology are needed to understand, prevent and remediate environmental issues with soils.

Table.1 Chemical Analysis of Soil

Sl.No	Elemental Composition	Weight (%)	Atomic (%)
1	C	7.62	13.94
2	O	28.17	38.67
3	Na	19.23	18.37
4	Mg	1.55	1.4
5	Al	3.9	3.17
6	Si	8.62	6.75
7	Cl	22.85	14.16
8	K	0.47	0.26
9	Ca	1.21	0.66
10	Ti	1.6	0.74
11	Mn	0.3	0.12
12	Fe	4.4	1.73
13	Cu	0.03	0.01
14	Zn	0.05	0.02

A SEM may be equipped with an EDAX analysis system to enable it to perform compositional analysis on specimens. EDAX analysis is useful in identifying materials and contaminants, as well as estimating their relative concentrations on the surface of the specimen.

The elementary analysis has been examined with EDAX. The prepared soil samples with carbon coated were subjected to scanning electron microscopy coupled with Energy Dispersive X-ray Spectrometer (SEM/EDAX) at an

In the present study, we used simultaneously both SEM-EDAX analysis to understand the differences in morphology, elemental composition of soil sample Collected from a Corbyn's Cove beach in Andamann and Nicobar Islands.

A. EDAX characterization

It was performed to know the chemical compositions of the minerals present in the soil. The data given in (Table.1) shows that the chloride, oxygen, sodium are present in major quantities while other minerals are present in trace amounts. EDAX spectrum shows the presence of dominant elements of Corbyn's Cove beach soil sample and represented in (Figure.3). The results indicated the presence of oxygen. Chloride, sodium, carbon as major constituents, while other elements such as silica, alumina, magnesium, calcium, titanium, manganese are present in smaller amount.

The Pi-chart graph shows the weight Percentage ratio of the elements constituted in the analysed soil sample. (Figure.4 and Figure.5)

The results obtained confirm the chemical composition of the soil.

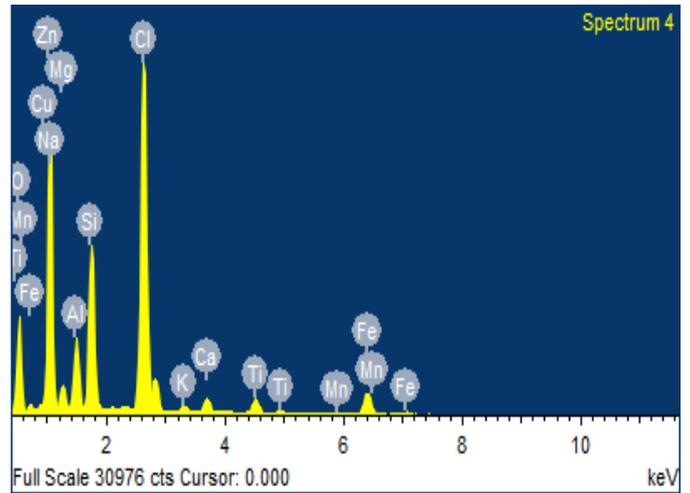


Figure.5.EDAX Analysis-Elemental Composition Vs Atomic Percentage

B. SEM characterization

Soils are complex assemblies of minerals, organic material, living organisms, water, and gases. The size, shape, and chemical composition of soil minerals are highly variables. High resolution images of surface topography of soil samples is shown in (Figure.6 (a, b, c, d, e, f & g)). All the soils are composed of micrometer-scale grains which consist of smaller particles with nano-scale structure The particle sizes of all soil samples except (Figure.6.e and Figure.6.g) are observed to be more inhomogeneous, (Figure.6 (a, b, c, d & f)).

For all of the samples, the area of soil particles was generally in the range of 5-20 μm². SEM picture of soil sample was taken at 20 kV and are presented in (Figure.6 (a, b, c, d, e, f & g)). It depicts the platy flakes and spongy structure of the soil. The submicron sized particles seem to have a rough coarse and rough morphology. Random distribution of shapes like square, and rhombohedra had been observed (Figure.6.g).

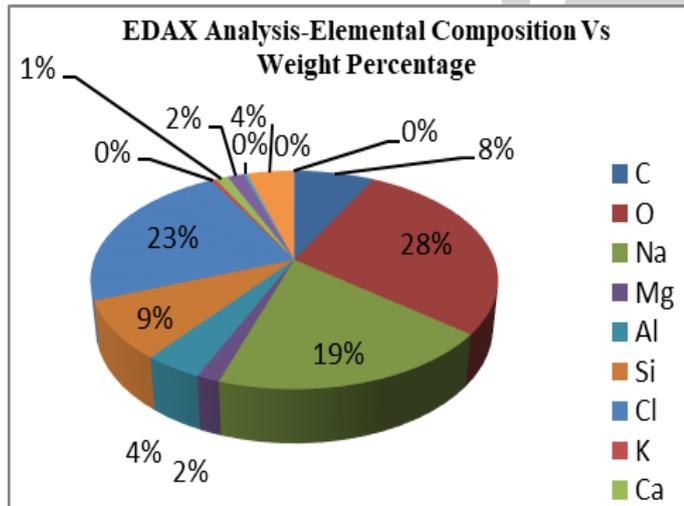


Figure.3 Energy Dispersive X- Ray Spectroscopy Spectrum of Corbyn's Cove beach Soil Sample

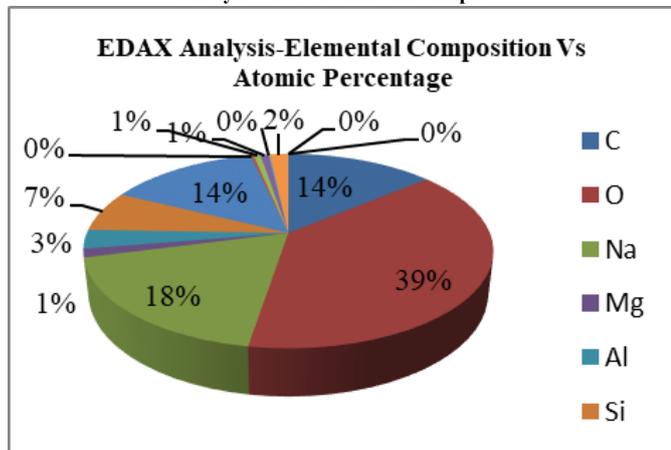
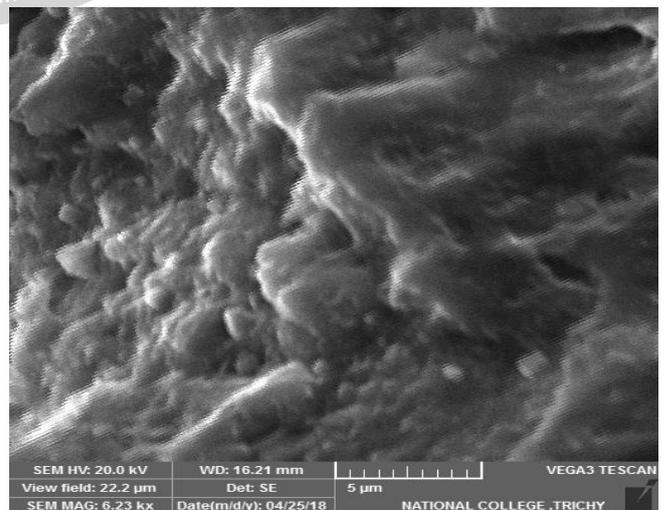
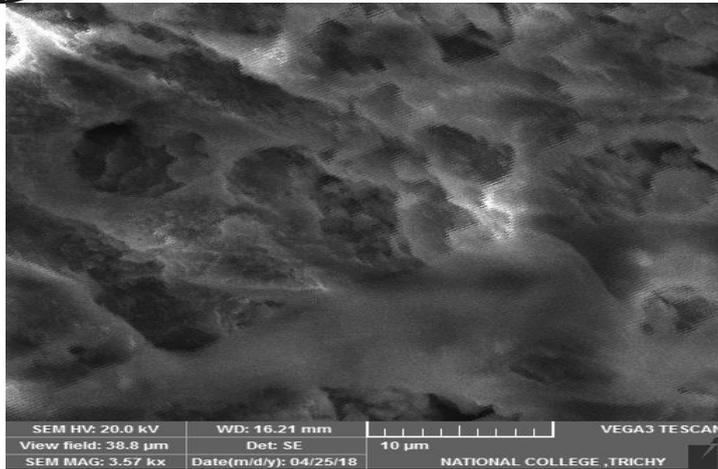


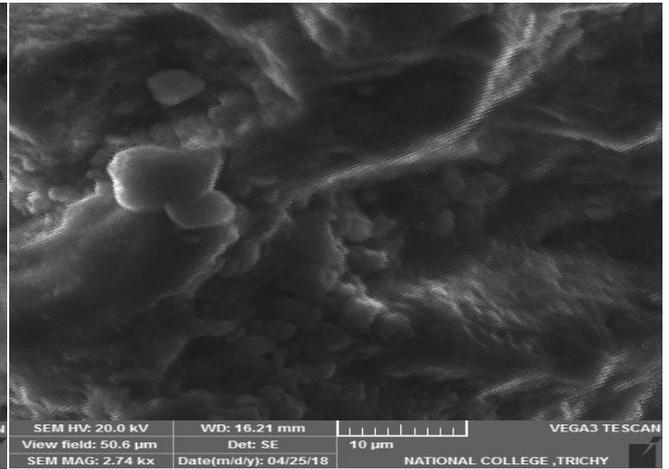
Figure.4.EDAX Analysis-Elemental Composition Vs Weight Percentage



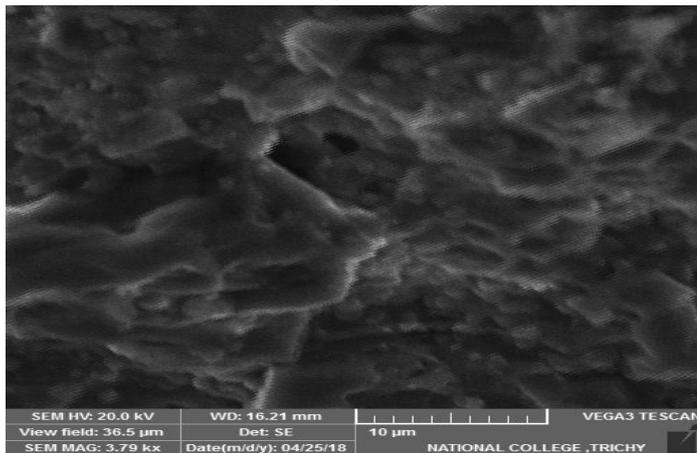
(a)



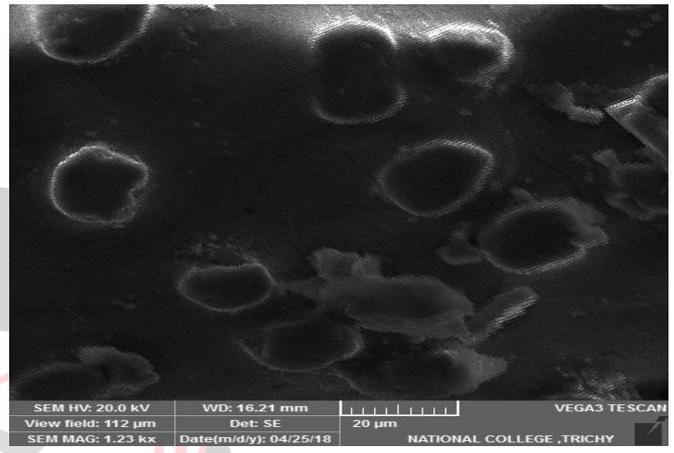
(b)



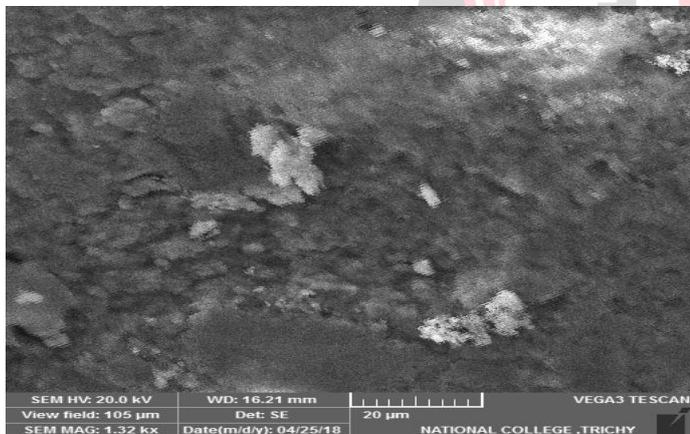
(f)



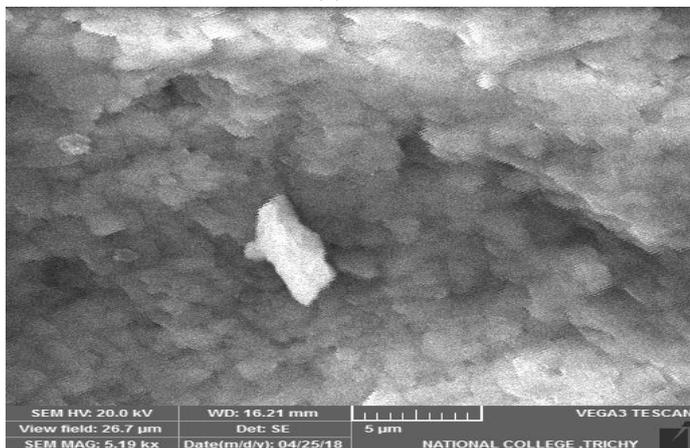
(c)



(g)



(d)



(e)

Figure.6.a, b, c, d, e, f, g. SEM-images of the analysed soil sample

From the results of EDAX and SEM analysis, it is concluded that the nature of the soil collected is found to be coarse and salty in nature. The ion exchange capacity of the soil sample may be in an acceptable range of normal level.

IV. CONCLUSION

The morphology of a beach is mainly controlled by wave, climate, tide and sediment characteristics. The qualitative identification of minerals in coastal soil samples of a Corbyn's Cove beach in Andamann and Nicobar islands have been studied. The soil samples were collected from Corbyn's Cove beach in Andamann and Nicobar islands, 100grams of seashore surface soil sample was collected in a clean polyethylene container. The soil samples were dried, milled and sieved out particles of ≤ 1 mm by drying at 60°C for three days in an oven to remove moisture. The dried soil was crushed and sieved and then stored in sterile, closed glass bottles for further investigation.

The elemental composition and morphology of atmospheric particles were investigated using SEM-EDAX system. The EDAX spectrum shows the presence of dominant elements such as chloride, oxygen, sodium while other minerals such

as silica, alumina, magnesium, calcium, titanium, manganese are present in trace amounts.

SEM picture of coastal soil sample was taken at 20 Kv with different magnification and it depicts platy flakes and spongy structure of the soil. The submicron sized particles seem to have a rough coarse and rough morphology. Random distribution of shapes like square, and rhombohedra had been observed. SEM and EDAX confirmed the possible phase, morphology of particles and elemental composition of soil samples in Corbyn's Cove beach, Andamann and Nicobar Islands.

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