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Morphology Variation of Coastal Soil Samples of Kanyakumari District in Fullmoon and Newmoon Day

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ABSTRACT:

The gravitational forces of the moon and the sun both contribute to the tides. The gravitational attraction of the moon causes the ocean to bulge out in the direction of the moon. Another bulge occurs on the opposite side, since the earth is also being pulled toward the moon. Tides are created because the earth and the moon are attracted to each other. The moon tries to pull at anything on the earth to bring it closer. Earth is able to hold onto everything except the water. Our survival is threatened the non-biodegradable wastes were accumulated in the coastal region. Accumulation of Non-biodegradable wastes also affects tides. Tidal variations affect the coastal morphology and concentration of minerals. In this present study reveals the variation of elements (EDAX), morphology (SEM, LM), particle size (Photon Correlation Spectroscopy) and zeta potential (Zeta analyzer) in full moon and new moon day. EDAX clearly showed the elemental variations in full moon and new moon day. Morphology and micro morphology studies clearly showed the different structure in different magnification. Photon Correlation Spectroscopy shows the different particles size and zeta analyzer confirms the different zeta potential values in full moon and new moon day.

KEY WORDS: Photon Correlation Spectroscopy (PCS), Scanning Electron Microscopy (SEM) and Light Microscopy (LM) and EDAX.

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1. INTRODUCTION:

Photon correlation spectroscopy (PCS) has become a powerful light-scattering technique for studying the properties of suspensions and solutions of colloids, macromolecules and polymers that is absolute, non invasive and non-destructive.[1] Photon correlation spectroscopy (PCS) is widely used to determine the sizes of particles in solution.[2-5] Application of the DLS technique to particle sizing and commercial availability occurred only about seven years after the first size measurements.[6]The zeta potential can be used to constrain the parameters (sorption equilibrium constants, capacitance(s) of the electrostatic surface complexation model. [7-9] Soil can be viewed as a liquid colloidal, colloidal solution or hydro soluble where water constitutes the dispersion medium and the dispersed phase is constituted by the soil plasma.[10] The negatively charged organic colloids are essentially dependent on the pH. Under strongly acidic conditions, hydrogen is strongly bonded to the functional groups and is not readily replaceable by other cations.[11-12]The complex interrelationship of physical, biological and chemical reactions involved in the formation of soil aggregates is very wide.[13] Among the various analytical techniques used for the elemental analysis, Scanning Electron Microscopy is highly qualified for the identification and the quantification of different elements in various samples of geological, biological and environmental importance.[14] SEM gives an insight of morphological analysis[15]. Image analyzers perform light-electronic analysis of the image obtained using a macro epidiascope or light or electronic microscope.[16-17]The Morphology of a beach is mainly controlled by wave, climate, tide and sediment characteristics. Sediments have also been studied by EDAX analysis to evaluate the changes and occurrence of heavy minerals in beach sands.[18] An equilibrium beach results from a balance of distractive and constructive force acting on the beach.[19]

2. MATERIALS AND METHODS:

2.1 study area:

The study area chosen for the present work is west coast of Kanyakumari District which is covering a distance of **75**km from Vattakottai to Vallavilai of Kanyakumari coast. Full moon and new moon day coastal soil samples were collected from ten different sea shore sites of west coast of Kanyakumari district during the month of September in the year 2018.

Table 1.Sample site number and location

Sample site no	Location	Sample site no	Location
S1	Vattakottai	S6	Kottilpaadu
S2	Chotthavilai	S7	Kurumpanai
S3	Rajakkamangalam	S8	Pattanam
S4	Muttam	S9	Thoothoor
S5	Manavalakurichi	S10	Vallavilai

2.2. Soil Samples Collection and Preparation:

The coastal soil samples collected the next day of full moon and new moon day of coastal regions of Kanyakumari District. Coastal soil samples were collected using Peterson grab at all the designated locations during low tide. The samples collected from ten different sites near sea shore regions. The distance between each site falls around 5kms (Table.1).The collected soil samples were initially sundried for seven days followed by drying in hot air oven at 383 +- 1K for two days. The dried soil was crushed, sieved and stored in sterile closed glass bottles till further investigation.

2.3 Elemental analysis (EDAX), Morphology (SEM), Micro morphology (LM), Particle size analysis and Zeta analysis of Coastal soil samples of Kanyakumari District:

The variation of elements present in soil, Ultra structure, Particle size and zeta potential in full moon and new moon day were carried out by different methods like EDAX, SEM, LM, PCS and Zeta Analyzer.

Energy dispersive X-ray spectroscopy is a technique that provides the elemental curve as output. Microstructures were examined by Scanning Electron Microscope (SEM) with JEOLJSM 6390 model. The chemical composition was determined by an Energy Dispersive X-ray spectroscopy (EDAX) attached to SEM. Microstructures were examined by Scanning Electron Microscope (SEM) with JEOLJSM 6390 model. The micro morphological structure were performed by Light Microscopy Leica Stereoluorescent microscope, Model M165FC(Make is Germany) with the HD camera model DFC310FX. The particle size and zeta potential were analyzed by the Malvern instrument Model Zeta sizernanoZS90, made in England.

3. RESULTS AND DISCUSSION:

3.1 EDAX analysis:

EDAX characterization was performed to know the chemical composition of coastal soil. The weight percentage of each element present in full moon and new moon day represented in Table 2 and 3

EDAX clearly showed (Fig 1 and 2) the elemental variations in full moon and new moon day soil samples of Kanyakumari district. The above figures and tables concluded that the full moon day sample contains eight elements like O, Na, Mg Al, Si, Cl, Ca and Fe. But the same sample site in new moon day contains only three elements O, Si and Ca.

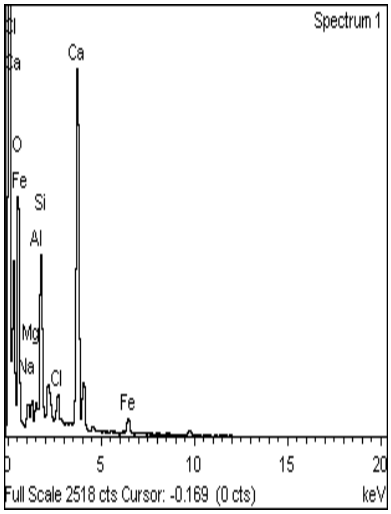

Fig 1. Edax spectrum of full moon

Table 2. EDAX Results of full moon day sample

Element (K)	Applied concentration	Weight%	Atomic%
O	53.93	62.31	78.36
Na	1.81	1.95	1.70
Mg	1.22	1.37	1.14
Al	0.83	0.79	0.59
Si	8.59	7.28	5.22
Cl	1.74	1.52	0.87
Ca	32.14	22.64	11.37
Fe	2.44	2.13	0.77

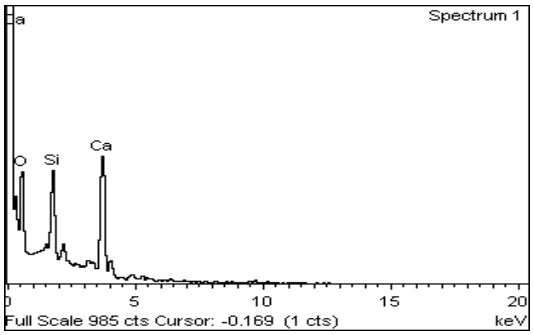

Fig 2. EDAX spectrum in new moon Day sample.

Table 3. EDAX Results in new moon day sample.

Element (K)	Applied concentration	Weight%	Atomic%
O	18.44	67.70	82.08
Si	4.05	11.09	7.66
Ca	8.89	21.21	10.27

3.2 sem analysis:-

Scanning Electron Microscopy gives an insight of morphological analysis of coastal soil samples. SEM picture of coastal soil sample was taken at 20 Kv with different magnification and presented in Fig 3 and 4. It depicts the tubular, spherical, Platy shape, triangular, rectangular, and nearly triangular and sun flower like appearance of the soil samples. Soil structure is defined as the size, shape and spatial arrangement of individual soil particles (aggregates). Soil structure is a dynamic property and it is subjected to genesis and degradation processes. The main factors that affect the genesis of soil structure are represented by the effect of cations interaction between clay particles under the in fluence of soil water content and temperature.

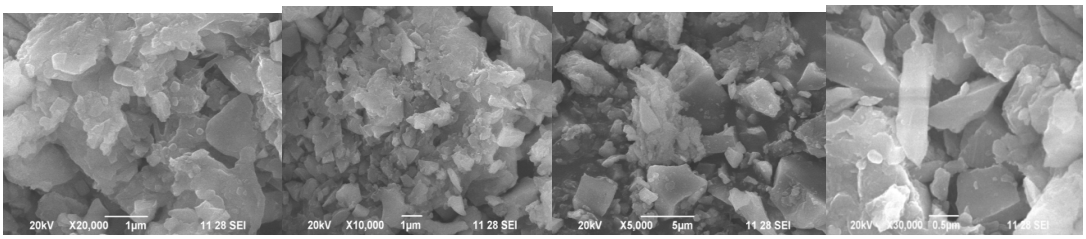

Fig 3.SEM images in full moon day sample

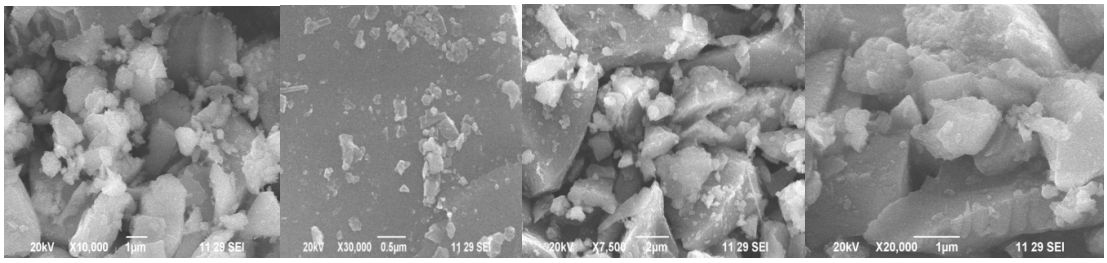

Fig 4.SEM images in new moon day sample

SEM analysis clearly showed the different morphological ultra structure in full moon and new moon day samples.

3.3 Light microscopic Analysis:

Light Microscopy (LM) study reveals that the different micro morphological structure of coastal soil samples of Kanyakumari District in full moon and new moon day. The micro morphological structures represented in Fig 5 and 6. In Fig 5 showed the yellow colour glassy appearance confirmed the presence of carbonate mineral like aragonite. In Fig 6 showed the light green dusty particle of aventurine and azurite. LM analysis clearly showed the different micro morphological structure in full moon and new moon day samples

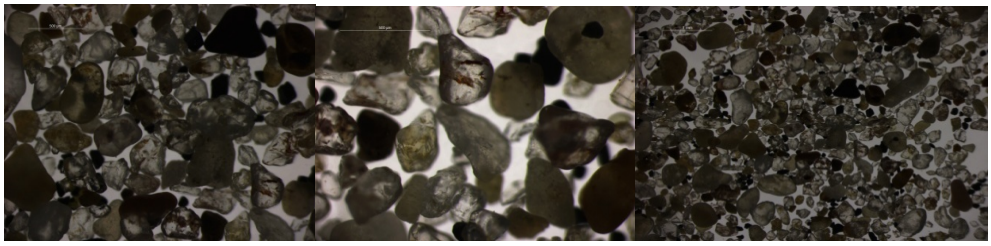

Fig 5.LM images in full moon day sample

Fig 6.LM images in new moon day sample

3.4 Particle size analysis:

Electrophoretic light scattering technique and Malvern instruments are used to measure the electrophorectic mobility of particles in dispersion. This mobility is converted to zeta potential to enable comparison of materials under different experimental conditions.

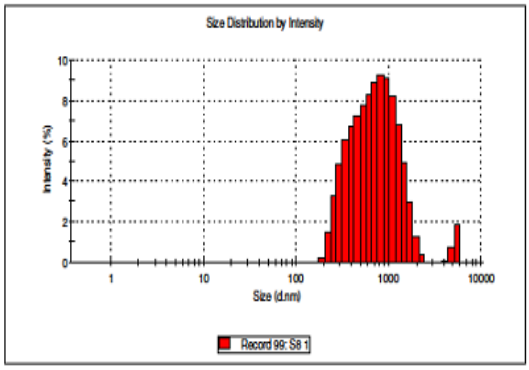

Fig 7.Size Distribution spectrum in Full moon day sample

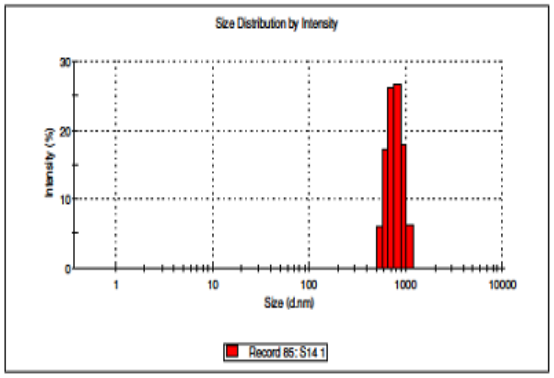

Fig 8.Size Distribution spectrum in new moon day sample

Photon correlation spectroscopy clearly represents the size distribution, Z average values, size and percentage of intensity of samples. The size verse percentage of intensity spectrum (Fig 7 and 8) showed the full moon day sample has particle distribution is high compared to new moon day sample this is due to the presence of more no of particles like elements and enrichment of minerals in full moon day.

3.5 Zeta potential analysis:

The zeta sizer provides a simple, fast and accurate way to measure zeta potential and uses a unique disposable capillary cell to ensure that there is no cross contamination between samples.

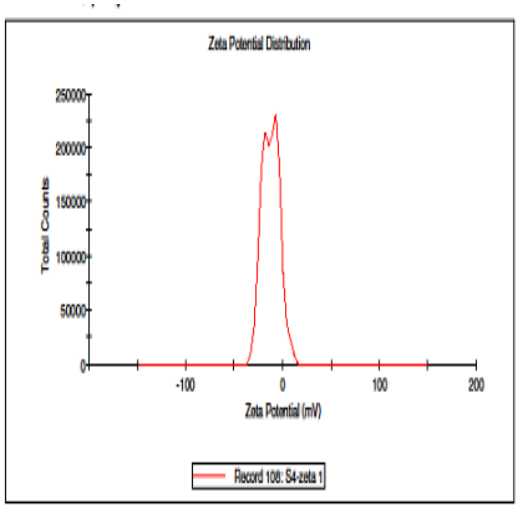

Fig 9. Zeta potential distribution images in full moon day sample

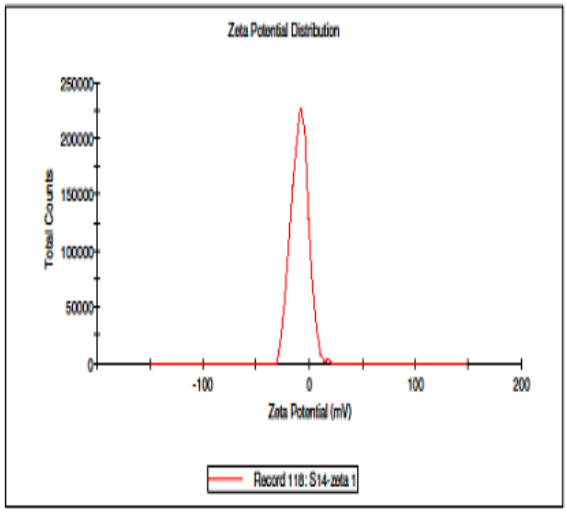

Fig 10. Zeta potential distribution images in new moon day sample

Zeta potential is a measure of magnitude of the electrostatic charge repulsion or attraction between particles. It is one of the fundamental parameter known to affect stability. Zeta potential measurements bring detailed insight into the causes of dispersion, aggregation or flocculation and can be applied to improve the formulation of dispersions, emulsions and suspensions. Zeta potential of soils changes in the presence of surfactants. Surfactants have been used to increase the efficiency of contaminant.

The Fig 9 and 10 showed the zeta potential value is approximately -10mv to -30mv it is clearly represented the stability behaviour of soil samples are incipient stability. Low zeta potential indicates less stability and also the aggregation of the particles. Higher zeta potential values either positive or negative are necessary to ensure stability and avoid aggregation of particles. Particle distribution is high due to the presence of more number of particles. But more aggregation of particles leads to less zeta potential. The zeta potential values are totally different in full moon and new moon day samples.

4. CONCLUSION:-

Coastal areas are one of the important coastal landforms and beach sands contain the most economically important mineral accumulations, wave action deposit sand on the beach and the heavy minerals are concentrated when back wash carries some of the lighter minerals such as quartz back into the sea. In this present study EDAX confirmed the weight composition of elements enriched in full moon day. The morphological and micro morphological (SEM and LM) showed the different ultra structures in full moon and new moon day.PES concluded that full moon day sample has particle distribution is high compared to new moon day sample this is due to the presence of more no

of particles like elements and enrichment of minerals in full moon day. Zeta potential indicates less stability and also the aggregation of the particles. The zeta potential values are totally different in full moon and new moon day samples. In this present study concludes that the full moon day samples show the accumulation of minerals than the new moon day samples because energy is little higher on the full moon day. The tides are rise on the full moon day because of the gravitational pull of the moon. Tides are one of the most important phenomena in the world they move in and out around twice a day. However, full moon and new moon day also affect the sea level and may cause both higher and lower tides. Full moon and new moon happen as the moon is around its closest point to earth is called perigee it leads to even larger variation between high and low tides are known as perigean tides.

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