****

**‘’ASSESSMENT OF SEDIMENT QUALITY WITH SPECIAL REFERENCE TO ORGANIC CARBON CONTENT’’**

**A DISSERTATION PROJECT**

*Submitted*

*to*

**DEPARTMENT OF CHEMISTRY,**

**INSTITUTE OF SCIENCES, SILVER OAK UNIVERSITY**

For the Award of the Degree of

Master of Science

in Chemistry

**FEBRUARY-2022**

*By*

**KANANI SAHILBHAI SHAILESHBHAI**

[200507021130]

*Under the Guidance*

*of*

**Dr. SHALINI CHATURVEDI**

Assistant Professor,

Department of Chemistry,

Institute of Sciences, Silver Oak University, Ahmedabad, Gujarat, India-382481

****

**CERTIFICATE**

This is to certify that Mr. KANANI SAHILBHAI SHAILESHBHAI (Enrollmet No. 200507021130) student of M.Sc. in Chemistry has carried out the dissertation under my supervision at Department of Chemistry, Silver Oak Institute of Science (SOIS), Silver Oak University, Gujarat, India.

The dissertation entitled “**ASSESSMENT OF SEDIMENT QUALITY WITH SPECIAL REFERENCE TO ORGANIC CARBON CONTENT**” is a record of bonafied research work carried out by him/her under my supervision and guidance for partial fulfilment for award of degree of Master of Science (Chemistry).

Date:

Place:

|  |  |
| --- | --- |
| **Name of Guide & Designation** | **Forwarded by,** |
| **Dr. Salini Chaturvedi** | **Dr. Manthan Panchal** |
| Assistant Professor | Principal of Science |
| Silver Oak Institute of Science, | Associate Professor |
| Silver Oak University | Silver Oak Institute of Science (SOIS), |
|  | Silver Oak University |

**DECLARATION**

ENROLLMENT NO.:200507021130

I hereby declare that this dissertation report entitled “**ASSESSMENT OF SEDIMENT QUALITY WITH SPECIAL REFERENCE TO ORGANIC CARBON CONTENT”** was carried out by me (**Mr. KANANI SAHILBHAI SHAILESHBHAI**) for the degree of Master of Science under the guidance and supervision of **Dr. SHALINI CHATURVEDI,** Assistant professor, Department of Chemistry, Silver Oak Institute of Science (SOIS), Silver Oak University, Gujarat, India. I will not publish this work anywhere without the consent from the supervisor.

Signature:

Date:

Place:

**TABLE OF CONTENT**

|  |  |  |
| --- | --- | --- |
| **SR NO** | **CHAPTER** | **PAGE NUMBER** |
| **1** | **INTRODUCTION** |  |
| **2** | **LITERATURE REVIEW** |  |
| **3** | **MATERIALS & METHODS** |  |
| **4** | **RESULTS & DISCUSSION** |  |
| **5** | **CONCLUSION** |  |

**ACKNOWLEDGEMENT**

**NAME OF STUDENT**

**LIST OF FIGURES**

|  |  |
| --- | --- |
| **Figure 1** |  |
| **Figure 2** |  |
| **Figure 3** |  |
| **Figure 4** |  |
| **Figure 5** |  |
| **Figure 6** |  |
| **Figure 7** |  |
| **Figure 8** |  |
| **Figure 9** |  |
| **Figure 10** |  |

**LIST OF TABLES**

|  |  |
| --- | --- |
| **Table 1** |  |
| **Table 2** |  |
| **Table 3** |  |
| **Table 4** |  |

**CHEPTER 1 INTRODUCTION**

**1.1  SEDIMENT POLLUTION :-**

Suspended sediment absorbs pollutants from flowing water in rivers and deposits onto the bed. However, the pollutants accumulated in the river bed sediment may affect the bio-community through the food chain for a long period of time. To study the problem the concentration of heavy metals (Cr, Cd, Hg, Cu, Fe, Zn, Pb and As) in water, sediment, and fish/invertebrates were investigated in the middle and lower reaches. The concentrations of heavy metals were 100-10,000 times higher in the sediment than in the water. Benthic invertebrates had relatively high concentrations of heavy metals in their tissues due to their proximity to contaminated sediments. Benthic invertivore fish had moderately high concentrations of heavy metals whereas phyto planktivorous fish, such as the silver carp, accumulated the lowest concentration of heavy metals. The concentrations of Cu, Zn, and Fe were higher than Hg, Pb, Cd, Cr, and As in the tissue samples. The concentration of heavy metals was lower in the river sediments than in the lake sediments. Conversely, the concentration of heavy metals was higher in river water than in lake water. While a pollution event into a water body is often transitory, the effects of the pollutants may be long-lived due to their tendency to be absorbed in the sediments and then released into the food chain. The heavy metals were concentrated in the following order: bottom material > demersal fish and benthic fauna > middle-lower layer fish > upper-middle layer fish > water.

**1.2  SOURCE OF SEDIMENT POLLUTION :-**

Sediment pollution is  increase due to the rapid increase of the population and development of industry.The sources of pollution are the untreated domestic and industrial wastes, atmospheric pollution, agricultural pollution, shipping, dredging activities in the harbor and the disposal of the dredged material to the outer bay. Among these, domestic and industrial wastes are the most important sources of pollution. Domes- tic wastewater is discharged to the bay from over 100 major raw sewage outfalls located either around the inner bay or at the streams flowing into the inner bay. Industrial wastewater is mostly discharged into the streams without being treated. Both domestic and industrial wastewater is dis- charged to the Gediz River, which is at the outer bay. Trace elements are good tracers to understand sources contributing to the pollution at a particu- lar site. Discharges from different industries have fairly different compositions. For example, Cd is known to be rich in fly ash discharged to the marine environment, discharges from alloy pro- ducing and ceramic plants, Cr is enriched in dis- charges from tanneries, textile and metal produc- tion, Cu is discharged particularly from metal plating and glass producing plants, Pb is a good indicator of traffic-related sources or battery recy- cling plants, Ni is discharged from the metal plating industry, S is rich in fly ash and discharges from petroleum processing, Zn is enriched in discharges from various industries such as tanner- ies, paint and metal plating. Mercury is an excel- lent tracer for paper production. Litophilic ele- ments such as Al, Si, Sc, Fe, Co, rare-earths can be used to identify natural sediment matrix com- ponents . Discharge data on other anthro- pogenic elements such as Sb, In, Mo are scarce, but they are enriched in domestic wastes and various industrial discharges. Enrichment of dif- ferent elements in different sources can be used to apportion sources contributing to the pollution at a given basin using trace element measure- ments. Such receptor oriented techniques are widely used in air pollution studies , but their use in water pollution studies is more limited due to reactivity of some of the elements in the marine environment.

**1.3  PHYSICAL AND CHEMICAL PARAMETERS OF SEDIMENT :-**

 Correlation analysis among physico-chemical variables in sedi-ments shows that many variables were correlated with each other . Physico-chemical variables can be divided into three groups. The first group includes organic material related variables: C, H, N, P, LOI, Bulk Density, Water Content . Bulk Density was negatively correlated with N and LOI and P, N, and LOI were positively correlated. The second group includes mineral and heavy metals: Na, Ca, Mg, Cd, Cu, Ni, Pb . Mg was positively correlated but Ca and Na were negatively correlated with heavy metals. Correlation analysis showed the strong positive correlation among heavy metals. This suggests that heavy metals came from the parent rock materials  and Mg can be a candidate for heavy metal indicators of parent materials.The other group includes P, Ni, Cu, Pb, N, and LOI . Phosphorus was strongly related with other variables in this group. The major portion of phosphorus in sediments is typi-cally bound to clay or soil particles . The relatively high phosphorus content in these metals.sediments may indicate a significant input of soil particles from the watershed . The relationships in the third group support that Mg and heavy metals originated from the parent materials in the watershed.

**1.4 EFFECT OF CARBON :-**

**A.  Effect of Carbon monoxide on human**

 The high concentration of CO can cause death The combination of CO and hemoglobin leads to the formation of carboxyhemoglobin (COHB) reduces the oxygen carrying capacity of blood. At a concentration of 100 ppm people experience dizziness and headache. • The cigarette smoke contains 400 to 450 ppm CO the percentage of COHB in blood of cigarette smokers increases with increase in smoking. At a concentration of 750 ppm of CO it will cause death.

**B effect of carbon monoxide on plane**

• co reduces nitrogen fixing bacteria. Which affects the plant growth. capacity of High concentration of causes leaf drops, reduces the size of leaf and ageing Effects on materials:- • Carbon monoxide appears to have no detrimental effect on materials.

**1.5 CONTROL OF SEDIMENT POLLUTION :-**

Reducing chemical fertilizer and pesticide use. • Recycling is another way to reduce and control soil pollution. Recycling paper, plastics and other materials reduces the volume of refuse in landfills, another common cause of soil pollution. Reusing of materials De-forestation, the cutting down of trees, causes erosion, pollution and the loss of fertility in the topsoil. Planting trees--or re-forestation--helps prevent soil erosion and pollution. Weeds soak up minerals in the soil. Reducing weed growth helps reduce soil pollution. One of the more common methods of reducing weed growth is covering the soil with numerous layers of wet newspapers or a plastic sheet for several weeks before cultivation. This prevents light from reaching the weeds, which kills them. Designated pits should be used for the dumping of soil wastes. These wastes should be treated chemically and biologically to make them less toxic and hazardous.

Pollution by sediment has two major dimensions :

One is the PHYSICAL DIMENSION - top soil loss and land degradation by gullying and sheet erosion and which leads both to excessive levels of turbidity in receiving waters, and to off-site ecological and physical impacts from deposition in river and lake beds.

The other is a CHEMICAL DIMENSION - the silt and clay fraction (<63m m fraction), is a primary carrier of adsorbed chemicals, especially phosphorus, chlorinated pesticides and most metals, which are transported by sediment into the aquatic system.

Erosion is also a net cost to agriculture insofar as loss of top soil represents an economic loss through loss of productive land by erosion of top soil, and a loss of nutrients and organic matter that must be replaced by fertilizer at considerable cost to the farmer in order to maintain soil productivity. The reader is referred to Roose (FAO, 1994a) for a detailed analysis of the social, economic and physical consequences of erosion of agricultural land and of measures that should be taken to control erosion under different types of land use, especially in developing countries. Whereas Roose is mainly concerned with the impact of erosion on agriculture, this publication is primarily concerned with agricultural erosion from the perspective of its impacts on downstream water quality.

Control of agricultural pollution usually begins, therefore, with measures to control erosion and sediment runoff. Therefore, this chapter deals with the principal mechanisms which govern erosion processes, and those measures which can be taken to control erosion. Processes discussed here also apply to fertilizer and pesticide runoff presented in the following chapters

**1.6  OBJECTIVE :-**

This Study Primary Aims to evolution of chemical characteristics of sediment.

A.  To determine the pollutant load of the selected sample of sediment.

B.  To determine the total organic carbon      content in sediment.

C.  To determine physical and chemical        parameters of sediment.

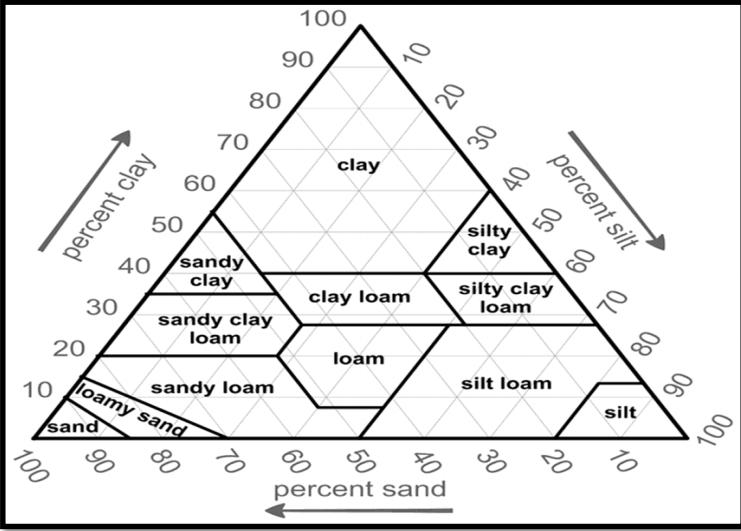
**CHEPTER 2. REVIEW LITRECHAR**

**CHAPTER 3. MATERIALS & METHODS**

**3.1 TEXTURE :-**

A portion of the air dried sample was hand crushed and analyzed for the soil texture and grain size (sand, slit and clay) after sieving through a series of standard sieves of different mesh sizes. The soil texture specifically refers to the proportion of sand, slit and clay in a mass of soil, while texture class determines the biological and biochemical reaction taking place in such soil. Soil texture or particle size distribution is a stable soil characteristic which influences physical and chemical properties of the soil. The sizes of the soil particles have a direct relationship with the surface area of the particles. Soil particles remain aggregated due to various types of binding forces and factors which include the content of organic matter, other colloidal substances present in the soil, oxides of iron and aluminium and the hydration of clay particles, etc. To estimate the content of various sizes of soil particles, the soil sample has to be brought into dispersed state by removing various types of binding forces. In the dispersed soil samples, the soil particles settle down at a differential settling rate according to their size. In the estimation of soil texture, particles below 2 mm diameter are separately determined which constitute sand, slit and clay.

Depending upon their size, the mineral particles of the soil or sediment may be differentiated as clay, slit, and sand. Different sizes of sieves are used to differentiate them according to the size of particles, details of which are given below Find sand : 0.5 – 2.0 mm diameter Slit : 0.2 – 0.5 mm diameter Clay : <0.2 mm diameter 100 g soil sample was taken after drying in shade. Then by using sieve of 3 different pore size, sand, slit, and clay were differentiated. Each fraction of the sieved soil was weighed and the percentage of sand, slit, and clay was calculated. The soil type was calculated from the soil texture triangle.



**Figure 1. Sediment texture triangle**

**3.2 TOTAL ORGANIC CARBON (TOC) :-**

Soils and sediments contain a large variety of organic materials ranging from simple sugars and carbohydrates to the more complex proteins, fats, waxes, and organic acids. Important characteristics of the organic matter include their ability to: form water- soluble and water insoluble complexes with metal ions and hydrous oxides; interact with clay minerals and bind particles together; sorbs and desorbs both naturally- occurring and anthropogenic ally-introduced organic compounds; absorb and release plant nutrients; and hold water in the soil environment. As a result of these characteristics, the determination of total organic carbon (a measure of one of the chemical components of organic matter that is often used as an indicator of its presence in a soil or sediment) is an essential part of any site characterization since its presence or absence can markedly influence how chemicals will react in the soil or sediment. Soil and sediment total organic carbon (TOC) determinations are typically requested with contaminant analyses as part of an ecological risk assessment data package. TOC contents may be used qualitatively to assess the nature of the sampling location.

Principle :-

The organic matter in the soil gets oxidized by potassium dichromate and concentrated sulphuric acid utilizing the heat of dilution of H,SO4. The excess potassium dichromate, not reduce by the organic matter of the soil is determine by back titration with standard ferrous sulphate (FeSO,7H2O) ferrous ammonium sulphate [FESO4 or (NH4)2SO46H2O].

Reaction :-

K,Cr2O, + 4H2SO4 + K,SO4 + Cr2 (SO4)3 + 4H2O + 30

C (Organic Carbon) + 20 + CO2

2FESO, + H2SO4+ O + Fe; (SO4)2+ H2O

Reagents :-

1. Standard 1N potassium dichromate: 49.04 gm of AR grade K,Cr2O, (oven dried at 90° C) is dissolved in distilled water and make up the volume to one Litre.

2. 0.5 N ferrous ammonium sulphate: 196 g of the hydrate crystalline salt dissolved in one Litre of distilled water containing 20 ml of conc. H2SO4. This solution is relatively more stable and convenient to work than that of ferrous sulphate. However, it should be prepared fresh for each set of samples.

3. Diphenylamine indicator: 0.5 g diphenylamine dissolved in a mixture f 20 ml of water and 100 ml of conc. H2SO4.

4. Concentrated sulphuric acid (sp. gr. 1.84) containing 1.25 percent silver sulphate (In case of soil free from chlorides use of Ag,SO4 can be avoided).

5. Ortho-phosphori…

calculation :-

Total organic carbon % = N(B-T)×0.003×100

Weight of sample (0.5) gm

Where; N= normality of ferrous ammonium sulphate

B= Blank reading

T= Titrate reading

**CHAPTER 4. RESULTS & DISCUSSION**

**CHAPTER 5. CONCLUSION**

**REFERENCES**

1. Air pollution in Delhi (2016). ENVIS Centre CPCB on Control of Pollution Water, Air & Noise.

2. Bandpi A.M., Eslami A., Ghaderpoori M., Shahsavani A., Jeihooni A.K., Ghaderpoury A. and Alinejad A. (2018). Health risk assessment of heavy metals on PM2.5 in Tehran air, Iran.17:347-355.

3. Basha S., Jhala J., Thorat.R, Goel S., Trivedi R., Shah K., Menon G., Gaur P., Mody K.H, Jha.B, (2010). Assesment of heavy metl content in suspended particulate matter of coastal industrial town, Mithapur, Gujarat, India. Atmospheric Reaserch, 257-265.

4. Bhaskar B.V., Rajasekhar R.V.J., Muthusubramanian P. and Kesarkar A. P. (2009). Ionic and heavy metal composition of respirable particulate in Madurai, India. Environmental Monitoring and Assessment.

5. Chaurasia S., Dwivedi P., Singh R. And Gupta A.D. (2013). Assessment of ambient air quality stutas and air quality index of Bhopal City (Madhya Pradesh), India, International Journal of Current Science, 9:96-11.

6. Development of Special Economic Zones in India. Volume 1: Policies and issues. Mookkiah Soundarapandian (2012). Concept Publishing Company. 7. Fung Y.S. and Wong L.W.Y. (1995). Apportionment of air pollution sources by receptor models in Hong Kong. Atmospheric Environment, 29(16):2014-2048. 8. Gharaibah A.A., Abdul-Wahab O. El-Rjoob, Harb M.K., (2010). Determination of selected heavy metals in air samples from the Northern part of Jordan. Environmental monitoring and Assessment, 425-429

9. Gharaibah A.A., Abdul-Wahab O. El-Rjoob, Harb M.K., (2010). Determination of selected heavy metals in air samples from the Northern part of Jordan. Environmental monitoring and Assessment, 425-429

Department of chemistry, K.S.K.V. Kachchh University Page 35

**“HEAVY METALS IN PM2.5 SAMPLES COLLECTED FROM INDUSTRIAL REGION”**

10.Gurjar B.R., Molina L.T. and Ojha C. S.P. (2010). Air Pollution Health and Environmental Impacts,CRC Press Taylor & Francis Group. 1-519. 11.Kamath and Lokeshappa (2014). Air quality indexing for selected areas in Bangalore city, Karnataka, India. International journal of Innovative Research in Science, Engineering and Technology, 3(8).

12.Kumar V., Patil R.S and Nambi K.S.V. (2001). Source of apportionment of suspended particulate matter at two traffic junction in Mumbai, India. Atmospheric Environment, 35:4245-4251.

13.Lamare R.E. and Chaturvedi S.S. (2014). Suspended particulate matter in ambient air of Shillong city, Meghalaya, India. Indian Journal of Science and Technology, 2(6):37-41.

14.Liu D., Deng Q., Zhou Z., Lin Y. and Tao J.(2018), Variation trends of fine particulate matter concentration in Wuhan city from 2013 to 2017. Environmental Research and Public Health.

15.Liu K.K., Shang Q., Wan C., Song P., Chanyuan M. And Cao L., (2017). Characteristics and source of heavy metal in PM2.5 during a typical haze episode in rural and urban areas in Taiyuan, China. Atmosphere.

16.Leili M., Naddafi K., Nbizadeh R. and Yunesian M. (2008). The study of TSP and

17. concentration and their heavy metal content in central of Tehran, Iran. Air Quality Atmospheric Health, 1:159-166.

18.Mahurpawar M. (2015). Effect of Heavy Metals on Human Health. International Journal of Research Grnthalya.

19.Mohanraj R., Azeez P.A., Priscilla T. (2004). Heavy Metals in Airborne Particulate Matter of Urban Coimbatore.,Archives Environmental Contamination and Toxicology, 47:162-167.

20.Popoola L. T., Adebanjo S. A. and Adeoye B. K. (2018). Assessment of atmospheric particulate matter and heavy metals. International Journal of Science and Technology, 15:935-948.

Department of chemistry, K.S.K.V. Kachchh University Page 36

**“HEAVY METALS IN PM2.5 SAMPLES COLLECTED FROM INDUSTRIAL REGION”**

21.Prusty B.A.K. (2012). Ambient air quality surveillance and indexing in and around mining clusters in Western Kachchh region, Gujarat, India. Journal of Air Pollution, 1:22-30.

22.Pathak C.Y., Mandaliya H.C., Roy D. and Jadeja R.B. (2015). Comparative study of ambient air quality stutas of Ahmedabad and Gandhinagar city in Gujarat, India. Chemical Science Technology, 4(1):89-94.

23.Particulate Matter (PM) Pollution, Health and Environmental Effects of Particulate Matter, EPA, 2017.

24. Prajapati S.K. (2012).Ecological effect of airborne Particulate matter on Plants. Environmental Skeptics and Critictics, 1(1):12-22.

25.Sharma M. And Maloo S. (2005). Assessment of ambient air PM10 and PM2.5 characterization of PM10 in the city Kanpur, India. Atmospheric Environment, 39:6015-6026.

26.Talebi, S.M., and Tavakoli-Ghinani, T., (2008). Levels of PM10 and its Chemical Composition in the Atmosphere of the City of Isfahan. Iranian Journal of Chemical Engineering, Vol. 5, No. 3, 62-67.

27.Vasilakos C., Pateraki S., Veros D., Maggos T., Michopoulos J., Saraga D. and Helmis C.G.(2007). Temporal Determination of heavy metals in PM2.5 aerosols in suburban Site of Athens, Greece. Journal of Atmospheric Chemistry, 57:117.

28.World Health Organization (2013). Health Effects of Particulate Matter.