Materials Science Research India Volume **3(2),** 175-178 (2005)

XRD AND SEM ANALYSIS OF TAPTI RIVER SEDIMENTS

B. H. Patil and V. S. Shrivastava

Centre for P.G. Research in Chemistry, G.T.P. College, Nandurbar - 425 412 (India)

(Received, 18 September, 2005)

ABSTRACT

For this study the sediment samples were collected from Tapti basin near Chopra district jargon, Maharashtra, India. The samples were sedimented and concentrated by centrifuge method for extraction of clay. X-ray Diffaction (XRD) and Scan Electron Microscopy (SEM) analysis have been carried out for the samples. The analysis indicate the clay samples contain Quartz (Silica) and Kaolinite minerals while smectite was found in traces.

Beside the above analysis the same samples have also been analysed for physico-chemical and metallic status.

Keywords: Clayminerals, XRD, SEM, Physico-chemical, Metallic status and Tapti basin sediments

INTRODUCTION

Tapti river basin is located at the foothills of Satpura ranges in Khandesh region of Maharashtra State. Around this river lot of small-scale industries like sugar, chemicals, thermal power, dairies, pulp and paper have been grown up. The effluents from these industries are being ponded to this river are being contaminated[1] by organic and metallic moieties.

The presence of minerals in soils and sediments is a result of both inheritance and authigenic formation of minerals. Several comprehensive reviews on the soil clay mineralogy[2-7] in the past indicate the there are not many examples that can claim to show how far mineralogy has proven or likely influence in soil genesis and management. A search for links between mineralogy and soil properties of agricultural importance is likely to be difficult because many time the description of minerals actually present in a soil is inadequate or incomplete[8]. Soil minerals differ from “type” mineral and thus it is necessary to investigate the properties of these minerals in view of the properties of the soil in bulk. In this endeavour a few examples from the data set held by the National Bureau of Soil Servey and ‘Land Use Planning” and that follows will indicate that despite soil clays being a mixture of several components, adequate description can be obtained if sustained efforts are made.

X-ray diffraction is the best technique for the identification and quantification of all the minerals present in the sediments and ricks. Engineering and industrial applications of rocks that contain clay minerals. This technique permits[9] reproducible and accurate calculation of the mineral content families. Fe rich chlorides + berthierine, Mg rich chlorides, Fe rich dioctahedral 2:1 clay and micas,Al rich octahedral 2:1 clays micas and kaolinates.

This study presents the XRD,SEM, some physico-chemical and metallic status o sediments and the interpretation of clay minerals in Tapti river basin sediments.

EXPERIMENTAL

Sampling sites

Top soil profile samples were collected from Tapti river basin at Chopra, Maharashtra and brought to the laboratory. Samples were airdried, grind, sieved through > 2µm and stored in plastic bottles.

SamplePreparation

50.0 gm of fine powered sediment sample was taken in 1 litter measuring cylinder and add 1 litter of distilled water through mechanical shaking for 30 min. Keep this measuring cylinder over night and next day supernatant liquid was decanted with the help of a into a plastic bottle. The separated clay samples slide for X-ray differaction analysis was prepared by ollowing the Millipore filter transfer method[10].

Instrumental

X-ray diffractometer with a Cu Ka radiation tube was used. Scanning electron microscope equipped with an energy dispersive analysis system was used for SEM analysis.

RESULTS AND DISCUSSIONS

The results thus obtained during the course of present study are given in Tables - 1 & 2 and XRD diffractogram and SEM analysis are being presented in the Figs. 1-4.

X-ray Diffraction

The XRD results indicate that the main constituents of the clay samples are quartz, Kaolinite and little of the smective minerals are present. The scans of the clay extract from all the samples are more orless similar and shown in Fig. 1 and 2. All the scan show a broad quartz peak centered from 3.3-3.5 A° a sharpen asymmetric peak at about 7.16 A° and a slightly asymmetric

Table -1 : General characteristics and minerals observed by XRD and SEM analysis

S. No.	Characteristic observed	No. of Sediments samples 1	2
1.	Mineral in XRD analysis	Quartz Kaolinite	Quartz, Kaolinate, Little Smectite
2.	SEM	Supported same minerals	Supports same miarals
3.	pH	8.60	8.70
4.	EC (µmhos/cm)	280	590
5.	OM	3017	2241
6.	COD	185	210

- The OM and COD in µg/g.

Table - 2 : Metals (µg/g) in sediment samples

S. No.	Metals	No. of Sediments samples 1	2
1	Cu	0.96	1.0
2	Zn	9.43	61.0
3	Cd	0.20	0.26
4	Pb	0.30	2.74
5	As	ND	ND
6	Hg	2.20	2.74
7	Ni	ND	ND
8	Cr	2.92	6.08

kaolinite peak was observed at 5.9-7.1 A°.asymmetry of the peak results froma combinationof changingLP factor and the much more symmetric peak with its maximum range of a scanning from 7.16-14.4 A° are observed. The quartz 20-10 % in the interstratified face by comparing the integrated peak intensities to calculated profiles was possible to estimate the proportion of each clay type. Therefore, XRD is one of the most versatile techniques for the materials characterization[9].

Scanning Electron Microscopy (SEM)

The SEM can be used for high resolution imaging of the surfaces with a large depth of field. We have scanned two sediment samples for scan electron microscopy analysis.the arrangement of partical size average of the obtained liquid face was investigated by SEM[11]. Figs. - 3 and 4 show the microscopy of typical clay particle size from the top soil profiles. These are different spacing in the same crystal confirming the presence of interstratified clays. SEM photographs clearly show the presence of quartz, kaolinite and little smectite minerals. These results also demonstrate the goodness of the particle size separetion methods (clay-size fraction).

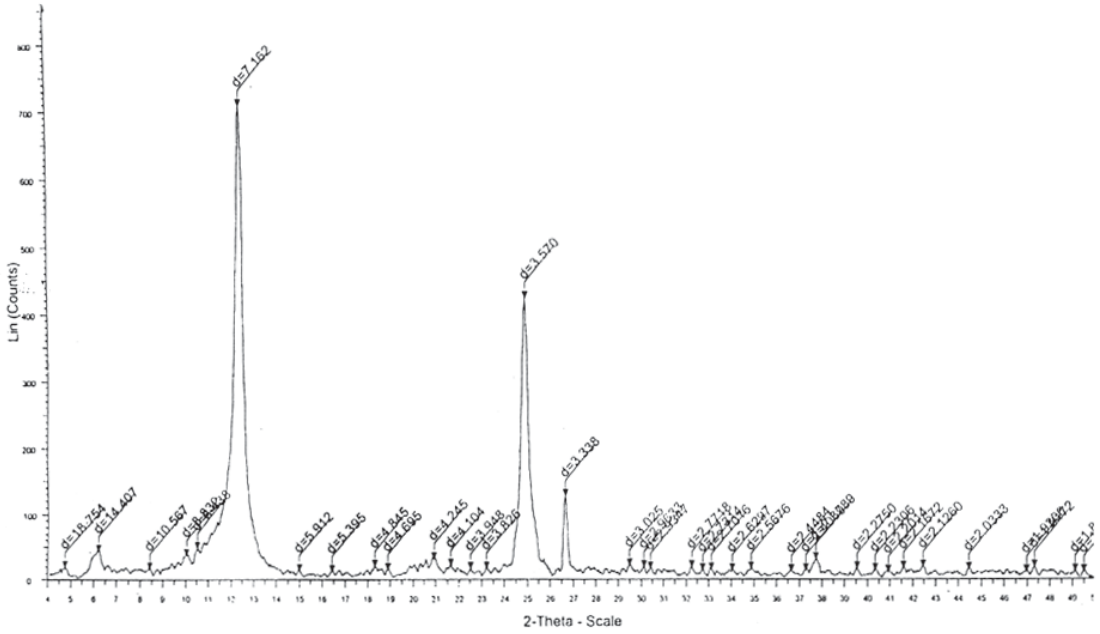

Fig. - 1: Representative XRD diagram of the > 2µm fraction Tapti river basin sediment, top horizon, Depth 0-20 cm

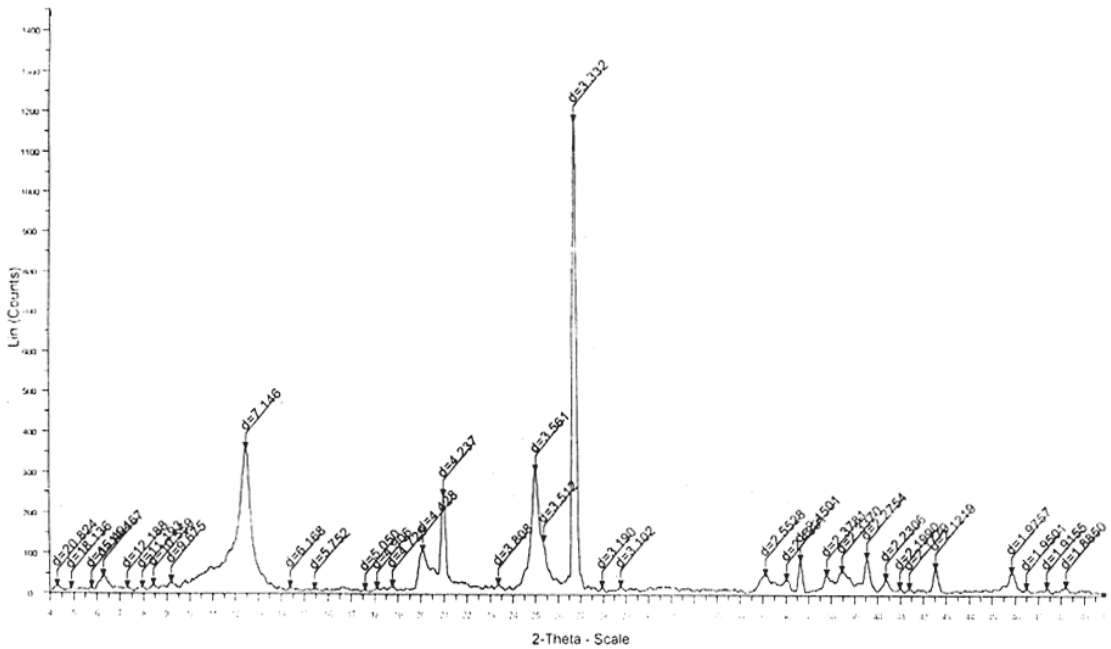

Fig. - 2: Representative XRD diagram of the > 2µm fraction of another Tapti river basin sediment, top horizon, Depth 0-20 cm

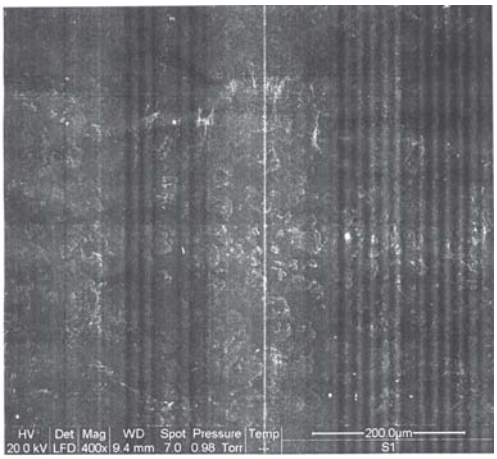

Fig. - 3: Represented SEM photograph of sediment sample (Tapti basin) No. 1, Top horizon 0-20 cm

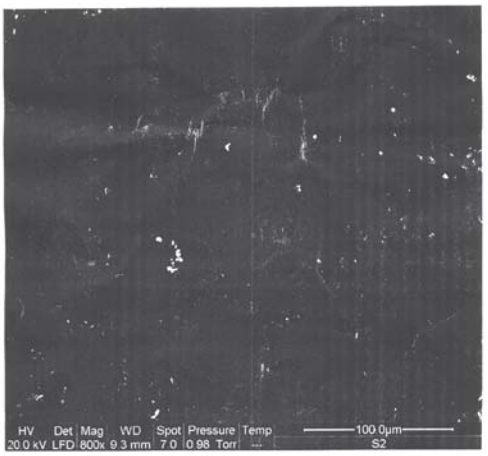

Fig. - 4: Represented SEM photograph of sediment sample (Tapti basin) No. 2, Top horizon 0-20 cm

The physico-chemical and metallic results of same samples have also been carried out and presented in Table - 2. these results clearly indicate the richness of organic and metallic moieties in these sediments[12-13].

ACKNOWLEDGEMENTS

Authors are gratefully acknowledge the SAIF, IIT, Mumbai and one of the author (VSS) is thankful to UGC, WRO, Pune for financial support.

REFERENCES

1. B.H. Patil and V.S. Shrivastava, *Ecology Env. and Conservation*, **9(2)**, 75 (2003)
2. S.K. Mukherjee, S.C. Das and K.V. Raman, Soil mineralogy in review soil research in India (Eds, J.S. Kanwar and S.P. Raychoudhari), Indian Society of Soil Science, New Delhi, 169 (1971)
3. K.V. Ramanand S.K.Ghosh, Bulleetin of the *Indian society of Soil Science,* **9,** 117 (1974)
4. S.K. Ghosh and B.S. Kapoor, clays minerals in Indian soils. In review of Soil Research in India, Transaction 12th *International Congress of Soil Science*, **2,** 703 (1982)
5. V.A.K. Sharma and P.S. Sidhu, Genesis and transformation of clay minerals, In review of soil research in India, Transaction 12th *International Congress of soil Science,* **2,** 718 (1982)
6. S.K. Ghosh and T. Bhattacharyya, Clay minerals - thir distribution and genesis in Indian soils, In advances in soil Science, Books and Periodicals in Indian soils, *In advances in Soil Science*, Books and Periodicals Agency. New Delhi, 216 (1983)
7. S.K. Ghosh, clay research in India, 13th Prof. J.N. Mukherjee, ISSS FoundationLecture,Jr. of *Ind. Soc. of Soil. Sci.,* **45,** 637 (1992)
8. D.K. Pal , T. Bhattachartta, S.B. Deshpande,. V. A. K. Sharma and M. Velayutham, *Significance of minerals in soil environment of India*. NBSS Review series 1, NBSS and LUP, Nagpur, 68 (2000)
9. Jan Sarodon, A. Victor, K. Doughlas Drits, Mc Carty, C.C. Jean, H. Sie and D. Dennis Ebert, Quantitative X-ray diffraction analysis of lay bearingrocks from random proportion, *Clay and Minerals,* **49(6),** 514 (2001)
10. D.M. Moore and R.C. Reynold, X-ray diffraction and the identification and analysis of clay minerals. 2nd edition, Oxford Uiv. Press, 216 (1997)
11. J. Goldstein, Sccanning electron Microscopy and X-ray Microanalysis, 3rd edition, Academic press, Dordrecht (2002)
12. D.K. Pal, Significance of clays, clay and other minerals in the ormation and management of Indian soils, *Jr. of Ind. Soc. of Soil. Sci.,* **51(4),** 338 (2003)
13. B.S. Choudhary and V.C. Chavadi, Deposition of Trace elements in the sediments of ponds around Lakamanahalli industrial area, near Dharwad city, Karnataka, *Ind. Jr. Env. Hith.,* **43,** 34 (2001)