



Research Paper

## Geochemical Characteristics of Clay Deposits in Kolayat Area, Bikaner District, Rajasthan

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### ABSTRACT

The district of Bikaner lies in North-Western part of Rajasthan which is a central part of Great Indian Thar desert and is well popular for its rich deposits of nonmetallic minerals like lignite, clays, fuller's earth, siliceous earth, gypsum, bentonite, silica sand, limestone and sandstone etc. throughout country and abroad. The endowed deposits of minerals in vicinity of Bikaner district are very much source raw material for many industries. Mining and its related activities are sources of employments for the local people and the socio-economic conditions are getting better in parts of Bikaner district. Opencast Clay, lignite, fuller's earth mining activities are in progress around Kolayat about 40 km south west of Bikaner district headquarter. The present study reveals that the concentration of certain chemical components like pH, EC, TDS, TSS, Chloride, nitrates, Bi-carbonates, Hardness, in surface water bodies from clay mine areas around Kolayat are high compared to that from non-clay mine pit areas. The colour of surface water bodies are also getting change in the study area due to mining activities. The resultant analyzed value are high according to Indian standard specification of drinking water i.e. IS 10500: 2012. High incidence of bacterial contamination is observed in dug well waters, which stresses the need for proper treatment prior to human consumption. Local people of Kolayat are using surface water for drinking as well as domestic purposes. Since Kolayatlake (Kapilsarovar) have aesthetic value where a famous annual fair is held and thousands of pilgrims dips in holy water of kapilsarovar. Degradation in surface water quality around Kolayat region of Bikaner district due to mining and other related activities, there is severe need to make remediation, sustainable development and managements.

**Keywords**-BIKANER, lignite, clays, fuller's earth, siliceous earth, gypsum, bentonite, silica sand, limestone and sandstone etc

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### I. INTRODUCTION

The district of Bikaner lies in north western part of Rajasthan which is a central part of Great Indian Thar desert and is well popular for its rich deposits of nonmetallic minerals like lignite, clays, fuller's earth, siliceous earth, gypsum, bentonite, silica sand, limestone and sandstone etc. throughout country and abroad. The endowed deposits of minerals in vicinity of Bikaner district are very much source raw material for many industries. Mining and its related activities are sources of employments for the local people and the socio-economic conditions are getting better in parts of Bikaner district. Clay is the important source material for the ceramic industries. There are many industries of plaster of paris, fertilizers and ceramics based on gypsum and clays. The adoption of unplanned and traditional mining methods are continuously deteriorate the surrounding by causing disturbing topographic features, drainage pattern, destruction of vegetations, adversely affecting the quality of surface and underground water etc. Water is a prime natural resource which is a basic need of human being and a precious national asset and hence it is strongly required to make suitable planning, development and management of it. Mining activities are also enhancing pollution of air, land and water in the area. The characteristics of mined land of clay, lignite, limestone, fuller's earth, gypsum and sandstone mining in area are very much untolerable. The mined out land due to indiscriminate quarrying of minerals in the area getting the undulating, barren, unfertile, dumped

Since the dawn of human civilization, one of the earliest mineral materials used by humans has been clay for different domestic and aesthetic uses. An amalgam of minerals with the ability to absorb water and transform into either plastic or liquid is referred to as clay. In general, the term "clay" refers to rock made up of several minerals, either in consolidated or unconsolidated form. Typically, they are silicate rocks that have weathered, but they can also be silicate minerals that have been deeply altered by hydrothermal solutions that have emerged from an igneous source.

An amalgam of minerals known as clay has the ability to absorb water and transform into either plastic or liquid. Clays have a particle size of 62 microns or less, or less than 1/16 mm. Around Kolayat, the in-situ clay is little damp and comes in nice chunks. The clay loses moisture and becomes friable when it is in contact with the surface. Due to organic impurities, in situ clay has a range of colors, including pale white, creamish white, grey, greyish white, and greyish black. It is found in good lumps [Plate II (A)] with a lot of moisture and ferruginous stains. The clay loses moisture when it is exposed to air, becoming brittle and chalky white in color. White clays in the vicinity exhibit circular stains and crisscross patterns that are brownish-re yellow brown and indigo in color and are likely caused by iron and sulfur.

## II. AREA OF STUDY

Rajasthan state has been divided into two major parts i.e. eastern and western by Aravalli mountain range that strikes NE-SW. The area west of Aravalli mountain range is western Rajasthan and is also known as Rajasthan basin which comprises of three smaller basins, referred as subbasins in the thesis. These three subbasins from North to South are Bikaner-Nagaursubbasin, Jaisalmersubbasin, the Barmer-Sanchorsubbasin. These subbasins encompass an area of 1,26,000 km<sup>2</sup> in which sedimentation took place during Mesozoic-Tertiary periods. The area around Kolayat (27°57' 72°57') is part of Bikaner- Nagaursubbasin in which sedimentation took place during tertiary times.

The tertiary sediments developed around Kolayat, 54 km WSW of Bikaner includes various types of lithounits like sandstone, siltstone, clay, marl, sandy calcareous grit, kankar, semiconsolidated conglomerates, fossiliferous limestone and sandy alluvium. Kolayat is a tehsil headquarter, is well connected with Bikaner by all weather 54 km metalled road and railway line. The Jaisalmer-Delhi NH-15 passes through the area of study.

The entire Tertiary basin in Bikaner is reserved for lignite mining except the Western part from Nal to Kolayat, where thick clays occur at shallow depth. This is the only area where producing clay mines exist in Bikaner district. Total leases exist for clay mining in Kolayat area in 7000 hectares. Producing clay mines in Bikaner-Kolayat area are at Nal, Goleri, Chandi, Khari, Indo-ka-Bala, Kotri, Marh, Jogira Talao, Sankhlon Ki Basti and Gurha.

The occurrence of clay around Kolayat is confined to sedimentary sequence of lower Tertiary period. Mineralogically, Bikaner district of Rajasthan can be referred to as "Clay district" because 80% of Rajasthan's total clay production comes from Bikaner district.

### Chemical Characteristics of Clays of Kolayat

Free Swell Index %	Liquid Limit %	Plastic Limit %	Plastically Index %	Strinkage Limit %	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	TiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub> + TiO <sub>2</sub>
122	58	37	21	18	56.99	28.08	1.83	2.06	3.89
144	68	36	32	20	57.16	28.20	1.82	2.08	3.90
344	54	20	18	14	56.13	21.33	7.15	2.93	10.08
200	38	32	25	12	53.23	18.46	15.32	2.52	17.84
157	29	24	9	11	55.10	13.32	5.90	0.80	6.70
13	50	35	16	14	57.55	13.96	4.65	0.78	5.43
20	26	17	8	10	60.45	14.52	3.59	0.56	4.15
29	62	26	24	15	63.49	20.81	1.21	2.64	3.85
38	48	28	30	16	66.83	20.41	1.01	2.25	3.26
57	28	17	11	12	63.30	15.10	3.62	0.89	4.51
1124	46.1	27.2	19.4	14.2	59.02	19.42	4.61	1.75	6.36

## III. CONCLUSION

Clays from Kolayat are suitable for use in the pyrotechnic, light kaolin, cosmetic, rubber, pain, and ceramic industries. Even though the raw clay from Kolayat doesn't meet the chemical requirements for ceramics and light kaolin because of its high iron and titanium content and low alumina content, it is extensively used in the ceramics industry to make insulators, ceramic tiles, and other items by coating them in an opaque glaze.

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