Characterization of Indigenous Bentonite as a Potential Drilling Mud

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***Abstract*: Clay Minerals are very most essential source on our earth. Mud drilling bentonite is likewise one of most important & abundant and close to the ground cost normally occurring substance start generally in the earth. Bentonite mud is produces after volcanic debris has endured and old within the sight of water. It has some properties. Bentonite has an actually ground- breaking negative electromagnetic charge and when invigorated inside to the water. In the momentum research, two examples of bentonite were taken, one is indigenous raw clay bentonite from Pakistan and other is industrial clay bentonite. The clay indigenous raw and industrial clay bentonite is examined regarding thickness, gel strength, density. Later on, clay indigenous raw bentonite was purified in last step these two bentonites are compared in terms of given parameters. The samples were analyzed by XRD. From the results obtained from experimental work, it was revealed that the two bentonites have similar results. However, as the indigenous bentonite is easily available & saves foreign exchange so it has a very good potential for use in oil & gas industry in Pakistan.**

***Keywords*: bentonite, drilling mud, purification, characterization Pakistan.**

I. INTRODUCTION

Indigenous Raw bentonite is a permeable Aluminum phyllosilicate soil comprising of montmorillonite, after the cretaceous Benton shale close to shake waterway, Wyoming. Bentonite earth typically structure enduring of volcanic debris regularly within the sight of water. Bentonite is utilized in drilling mud to grease up and cool the cutting equipment's, to eliminate cutting and to help prevent blowout. The most well-known smectite clay is montmorillonite, and montmorillonite is the vital piece of bentonite, montmorillonite can develop by a multiple of times its exceptional volume when it soluble in water this makes it important as a drilling mud to keep drill holes open and to associate spills soil, rock and dams. Montmorillonite, regardless, is an unsafe sort of earth to encounter if it found in section of road cuts. Because of its expandable nature. Bentonite in penetrating mud to extricate bit cutting from the spot bentonite expands significantly when presented to water,

II. MATERIALS & METHODS

A. *Indigenous bentonite*

Indigenous clay bentonite is usual material the properties of clay water-based muds, rock shape indigenous clay bentonite available easy anywhere into the Pakistan, mostly in KPK Province situated in shagia called karak bentonite

Figure. 01

A. *Industrial bentonite*

In Oil & gas industry drilling mud are used for various purposes bentonite is also of them industrial bentonite is used in drilling fluid to lubricate & cool cutting equipment's, and to remove cuttings, and help to come out subsurface color is brown and in powder shape it was already purified to use as a drilling fluid.

Figure. 02

A. Indigenous raw bentonite purification

In this method includes crushing, dispersion, and centrifugation parting of indigenous raw bentonite.10 gram of raw bentonite was mixed into 100ml of deionized water with about 0-0.5g 1gram % 1.5Gram & 2.0 gram & of additive NaPo3 was added and stirred magnetically 24h. then bentonite mud samples was place into centrifugal machine run 4500/RPM bentonite mud particle place bottom of glass and water was separated through centrifugation process after than in purification process that sample placed in dying over for dying proposes at 100C for when sample completely convert into solid form it is prepared for characterized

Two types of purification method were used

Simple sedimentation method

Classical NaCL treatment

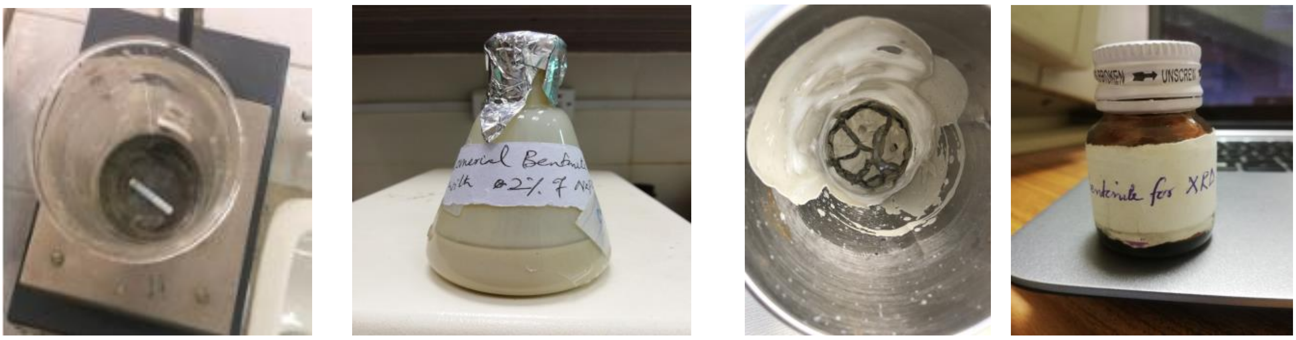


Figure. 03

III. RESULTS

Mud Composition

Compound	Lab unit	Field unit
Water	350	1 bbl.
Standard bentonite	22.5 gm	lb

AV	10.5	cp
PV	7	cp
YP	6	Lb/100ft
API fluid loss	14	ml
Mud cake thickness	4	mm

Physical specification purified bentonite

AV 600rpm	45 cp
AV 300 /rpm	40 cp
YP	35 lb 100 ft
Density	13Lb/gal
Gel strength	7.5pound/100

Physical specification industrial

Av 600rpm	25 cp
AV 300rpm	20 cp
YP	15 lb 100ft
Density	9lb/gal
Gel strength	5.4 pound/100

Characterization of indigenous raw bentonite & Industrial Bentonite

The chemical composition of purified bentonite indigenous was determined by SEM & EDS. XRD Chemical characterization of purified bentonite verify that it is mainly montmorillonite. the typical formula of montmorillonite is (Na,Ca)0.3 (Al,Mg)2 Si4 O10 (OH)2•n (H2O). Electron microscope (SEM) is a machine which capture the photograph of material SEM image showed how bentonite particles widely zoom X100 on 100um increase size (fig.1a) & (fig.1b), (fig.1c), (fig.1d) The morphology of the mineral particles for increasing particle size as well as collective crushing time was detected using an Electron microscope SEM and the occurrence of montmorillonite

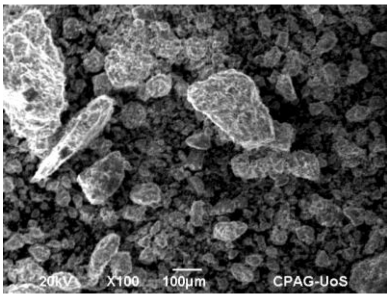


Fig.1a

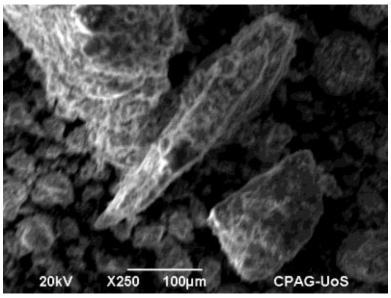


fig.1b

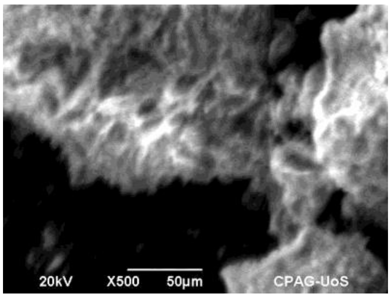


Fig.1c

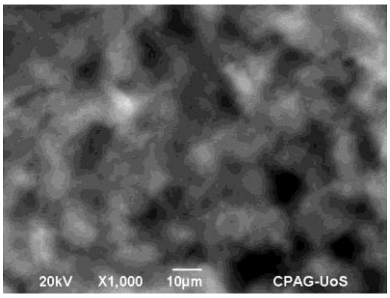
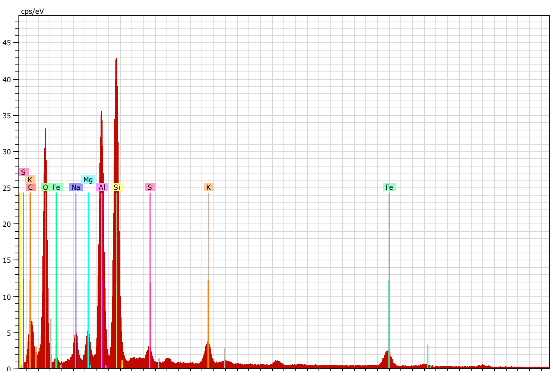


Fig.1d

Fig. 1. Particle size distribution and SEM images of bentonite particles for increasing grinding time (a). XRD patterns of the purified bentonite for increasing grinding time with dispersant dosage of 1% and centrifugal speed of 700 r/min (b). A graphic summary of (M/M + Q) XRD intensity ratio as a function of grinding time (c). Montmorillonite content and yield versus grinding time (d). MD = median diameter.



Graph of indigenous raw bentonite after purification

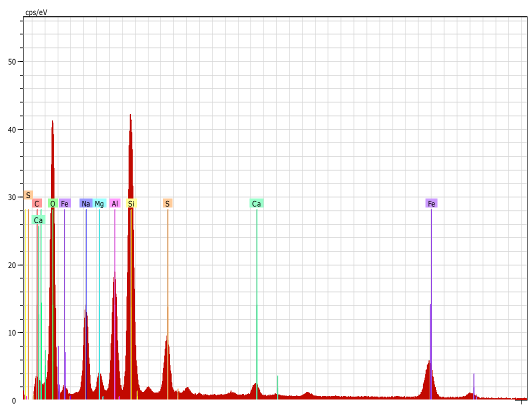
Chemical Composition and Element Analysis

Chemical composition of the indigenous raw bentonite after purification changed in the XRD pattern characteristic peaks of feldspar, dolomite and calcite disappear for purified bentonite which mean feldspar, dolomite and calcite have been removed (fig.4a). The diffraction peaks intensity decreases for quartz and increases significantly for montmorillonite compared with that of the raw bentonite

Table 1 Element Analysis of Indigenous Bentonite

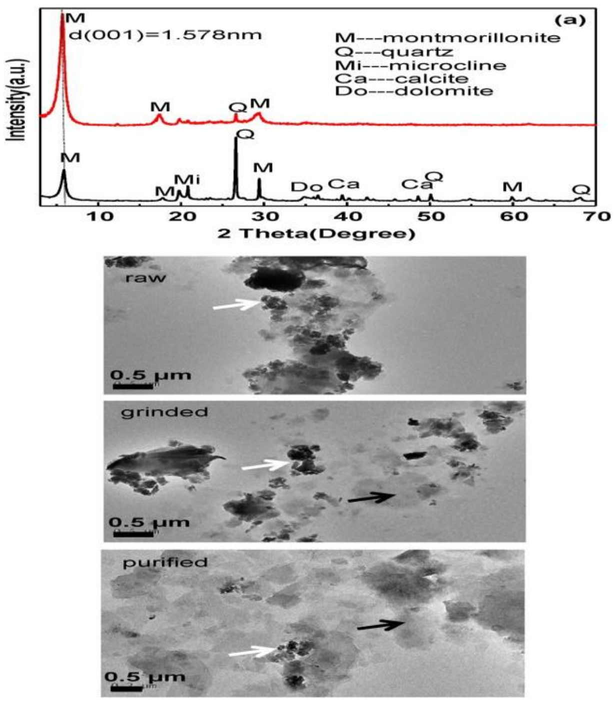
Element	Unn Wt. %	Norm.at%	C Atom.%	c.error
Carbon	2.23	2.57	4.28	1.8
Oxygen	44.14	50.90	6.52	5.2
sodium	2.86	3.30	2.87	0.2
Magnesium	1.82	2.10	1.73	0.1
Aluminum	13.4	15.04	11.13	0.7
Silicon	15.43	17.80	12.65	0.7
calcium	2.31	2.67	1.36	0.1
Iron	3.42	3.95	1.41	0.1
Sulfur	1.45	1.67	1.41	0.1
Total	84.74	100: 00		

This system detects the [Grab your reader's attention with a great quote from the document or use this space to emphasize a key point. To place this text box anywhere on the page, just drag it.] R-rays emitted from a sample during electron imaging. The system consists of three main component X-RAY detectors separated from the SEM chamber by a very thin polymer window pulse processing characteristic x-ray detector is a housed inserted into sem chamber so that the detector is very close to the final aperture of the SEM column, and pointed at the surface of specimen. The detector is semiconductor made of silicon doped with lithium X-rays striking the semiconductor crate and electrical charge with in the semiconductor. This charge is then analyzed to determine x-ray an energy and the number of x-rays being emitted. EDS results carbon value is 2.23 and atom of carbon 4.28% oxgen 44.14 compared the result of industrial bentonite 46.17 weight and sodium normal value present in raw bentonite after purification 2.86 and in industrial bentonite 7.30 magnesium 1.82 in other sample of industrial bentonite 1.21 Aluminum 13.04 wt% of raw indigenous and Aluminum in industrial bentonite 6.32 mean in half value Sillicon is 15.53 & in indusrial bentonite 12.14 wt% of sulfer in sulfer 3.16 in indusrial bentonite.



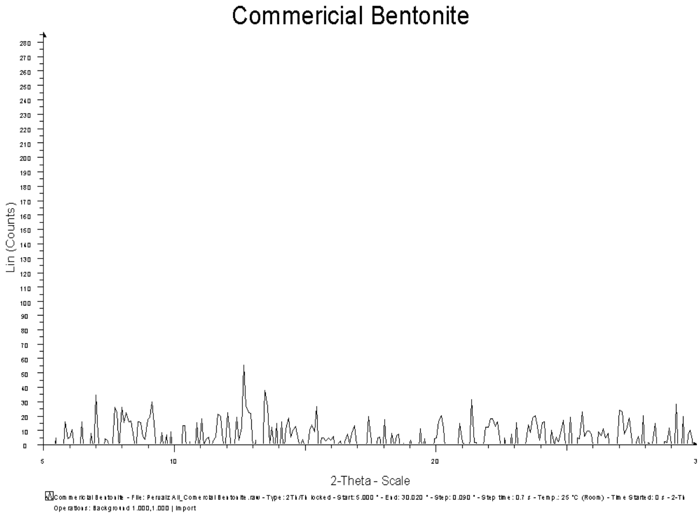
Graph of industrial bentonite aft purification

Fig 3



XRD of raw and Purified Bentonite (a) image of raw, grinded and purified bentonite (b) the white points to show quartz, and black arrow indicate Montmorillonite.

Fig 4 XRD 2theta degree before purification Bent-1



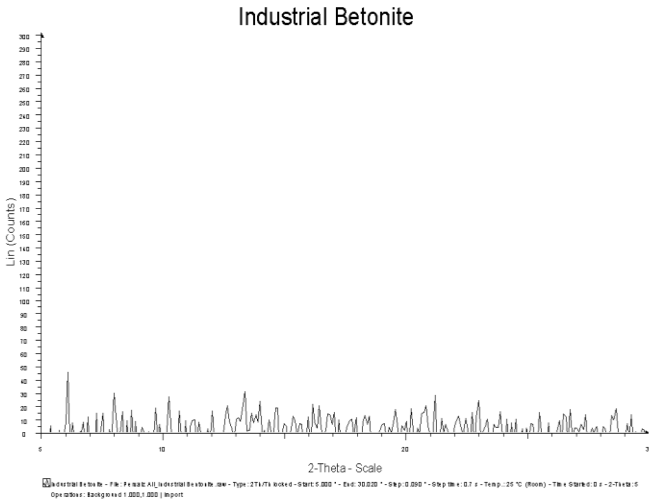
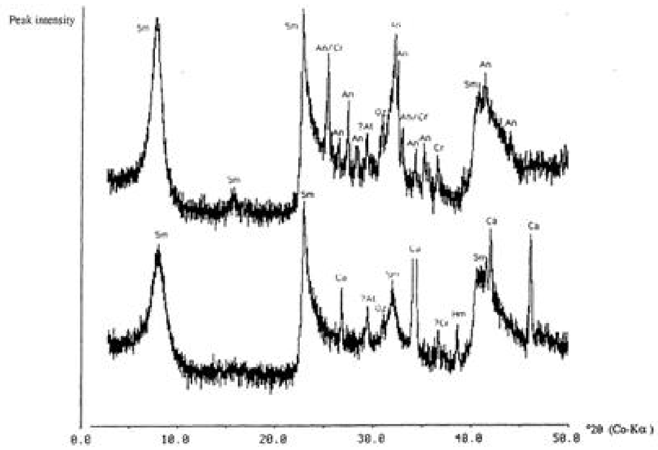


Table 2 element analysis of industrial bentonite

Element	Unn wt.%	Normal%	C Atom %	C error
Carbon	1.93	2.24	3.72	0.4
Oxygen	45.17	53.48	66.69	5.2
Sodium	7.30	8.46	7.34	0.1
agnesium	1.21	1.40	1.15	0.1
Aluminium	6.12	7.09	5.24	0.3
Silicon	12.14	14.06	9.99	0.5
Sulfur	3.16	3.66	2.28	0.1
calcium	0.95	1.10	0.55	0.1
Iron	7.35	8.52	3.04	0.2

Total : 84.44 100:00

Fig 4&5 The above graph of 2theta result show poor peak but the intensity of the peaks are similar chemical analysis of raw & industrial bentonite before purification XRD pattern show very poor Intensity of samples



XRD after Purification of indigenous bentonite

IV. CONCLUSIONS

The indigenous raw bentonite samples were taken from local market & industrial bentonite were taken from OGDCL kunar gas field both bentonites were analyzed comparatively both in properties in composition was similar after purified & characterized the above graph of 2theta result show poor peak but the intensity of the peaks is similar chemical analysis of raw and Purified same shown in table 1 & table 2 the Slight decrease & increase of mineral respectively conformed the montmorillonite ratio present after purification by method simple sedimentation using sodium hexametaphosphate which the ratio of montmorillonite show in graph 1 element trace analysis was observed.

V. RECOMMENDATIONS

The local indigenous raw bentonite is sufficient in montmorillonite clay and it should be treated and Purified in simple process and also very cheap method in this clay minerals with treatment process, the local indigenous clay can be effectively used as drilling fluid by the using of additives to drill the upper section of the oil zone this process will be save cost of drilling if these local and cheap drilling muds are utilized

Fig. 1: drilling rig bentonite mud using during drilling process

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