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Characterization of natural zeolite from ALGedaref state in Sudan

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ABSTRACT

In this study, samples of one type of natural zeolite were selected and determined the characters, samples were collected from ALGedaref state, eastern part of Sudan . The structures of the samples are characterized using X-Ray diffraction analysis(XRD) showed to be natrolite associate with mesolite, and Scanning Electron microscopy (SEM) The chemical and physical properties as well as the chemical composition of the samples were determined by Infra-Red spectrophotometry (IR), Theromo gravimetric Analysis(TGA),and X-ray fluorescence (XRF) The results obtained reveal natural zeolites are of very high quality compare to many other natural zeolite.

The results shows in tables and figures below the good properties of algedaref natural zeolite.

KEY WORDS

Natural zeolite, X-ray diffraction analysis (XRD), Scanning electron microscopy (SEM),Thermal analysis (TGA).

1 .INTRODUCTION:

Zeolite was discovered and named in 1756 by the Swedish mineralogist Fredrik Axel. The term zeolite , derived from the Greek words (zeo) which means something that boils and(lithos) which means stone.(1)Then recently geologists described that zeolite is volcanic rocks (2-3)

Zeolite shot alkali and alkaline cations apropos crystalline hydrated alumino silicate open three dimensional structure. The general formula for zeolite is:

$(Li, Na, K)_a(Mg, Ca, Sr, Ba)_b \{Al_{(a+2d)}, Si_{n-(a+2d)}, O_{2N}\}.m\ H_2O$

Spin the attachment of the field brackets engage in the setting atoms and the appliance of the additional frame of reference atoms broadly the space brackets is cations advantage biggest molecules(4).

1.2 APPLICATION OF ZEOLITE

The field of environmental applications of natural zeolite is quite well investigated. The chemical modification of the zeolite considerably extends their application possibilities and increases their effectiveness providing them with specific properties. Because of this reason, the investigations in direction are of particular interest. number of reports concerning the chemical modification of an inorganic carriers (5-7)

zeolite can be used to remove polletants, both gas and waste water, construction catalyst, medical use and agriculture. These applications are related to the adsorption properties of zeolite.(8)

1.3 LOCATION

The area of the study covered part of Gedaref state, located at the Eastern Sudan along the

international border with Ethiopian. Generally. It is bounded by the latitudes 12^0 45-14^0 53` N and

longitudes 350 10 -360 10` E

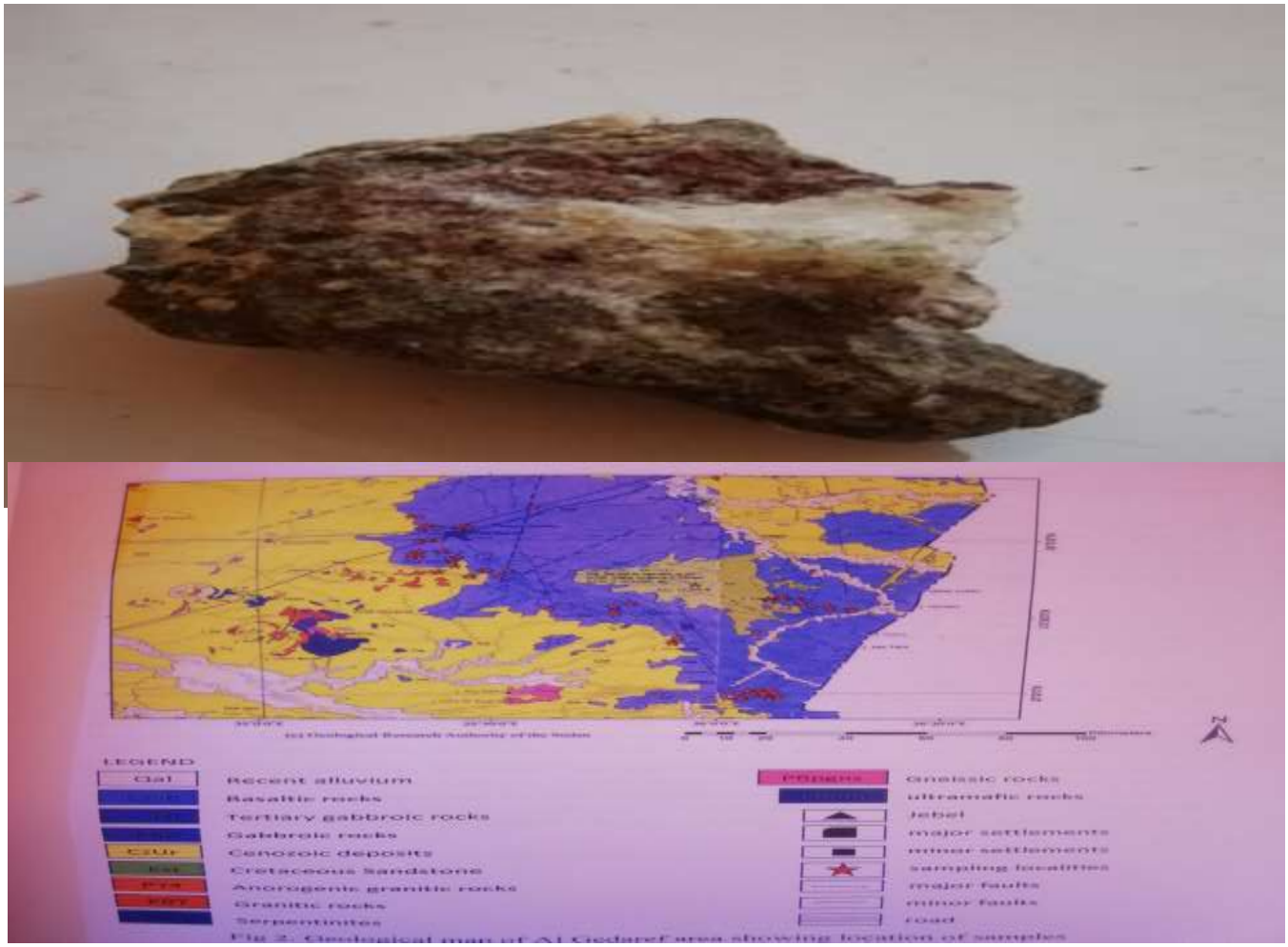


Fig. (1) zeolite from AlGedaref

Fig2. Geological map of Al Gedaref area showing location of samples

2.MATERIAL AND METHOD

2.1.Preparation of zeolite sample

Zeolite sample from Gedaref state were grounded then washed, dried, crushed and sieved to fine powder. The powder zeolite was then washed with distilled water to remove impurities, and dried overnight in an oven at $105C^0$.

2.2 Experimental and Characterization

The important techniques in this work are X-ray diffraction (XRD) the samples were measured with an x-ray (GNR Explorer stress XRD analyzer Cu –target. Radiation is used to illustrate the crystallization of samples

The surface morphology of the treated zeolite was studied using scanning electron microscope (SEM).We used to determined chemical composition reported as oxides(XRF)and (IR) to show internal structures, and thermal analytical measurement were carried out on (TGA) STA Jubeter system.

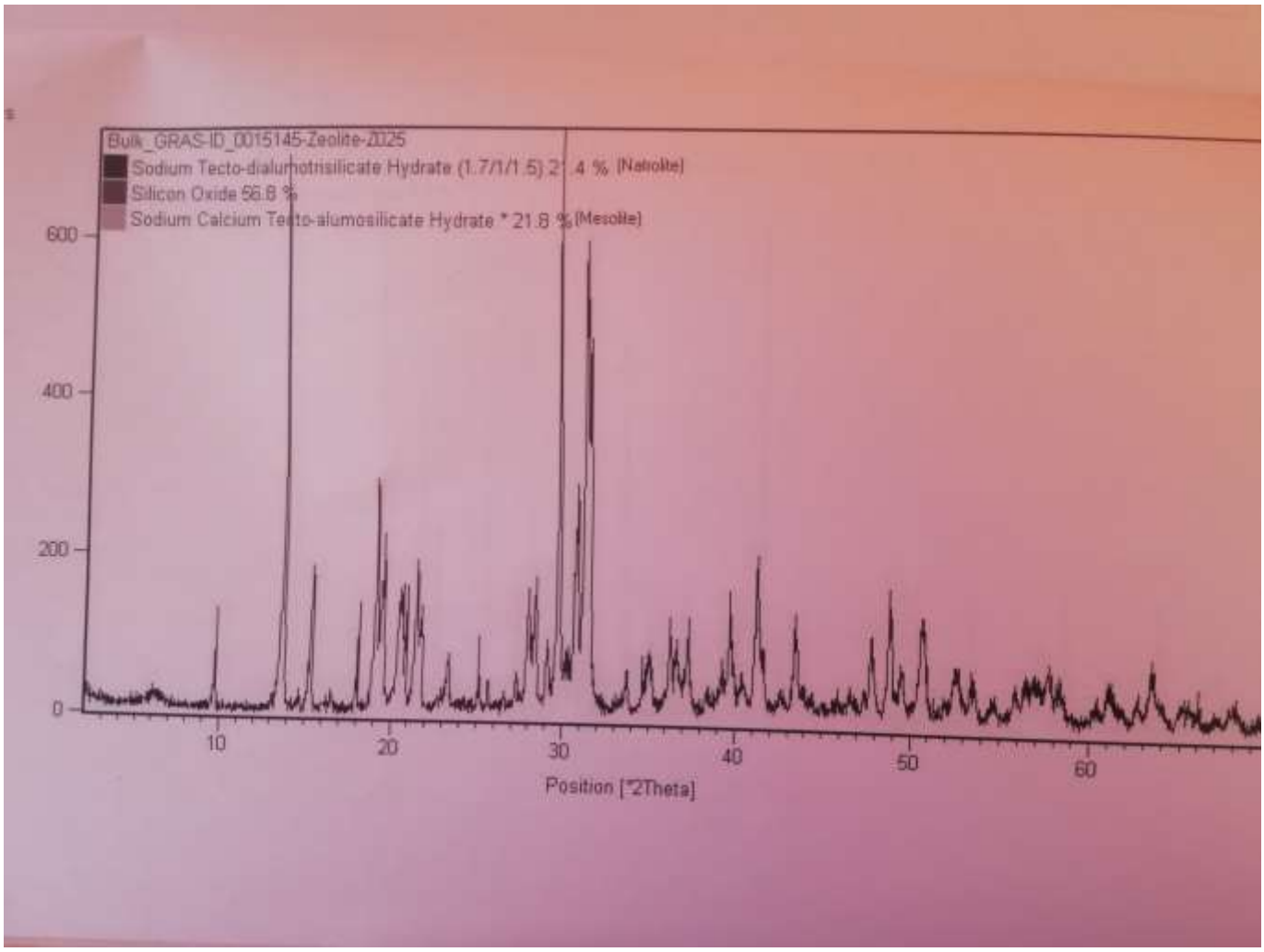
Fig (3) (XRD) diffraction for natural zeolite

3. RESULTS AND DISCUSSION:

3.1. Materials characterization

3.1.1X-Ray Diffraction Analysis

It was shown in figure(3) the formation of natural zeolite with high silica



X-Ray diffraction analysis shows the pattern of X-ray diffraction carried out on natural zeolite, in which different mineralogical phases are observed

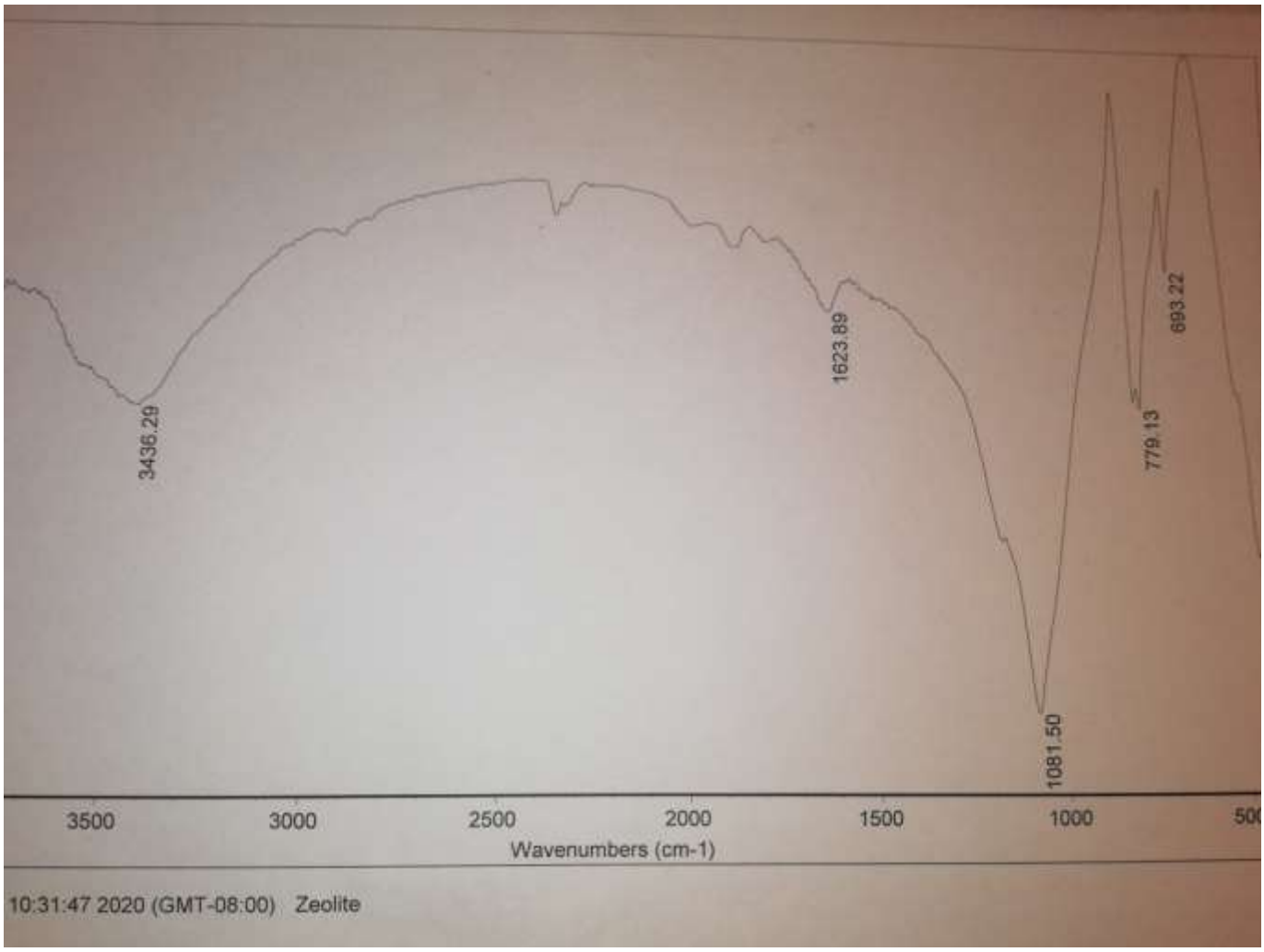
The first peak in rang (140-160) due to silicon oxide and natrolite

3.1.2. IR characterization

Fig. (4) FT-IR spectra of the natural zeolite.

It was shown in fig(4) in which it can be observed that the band associated with the symmetric and asymmetric stretching vibrations of the hydroxyl functional group is situated at 3614cm^{-1}

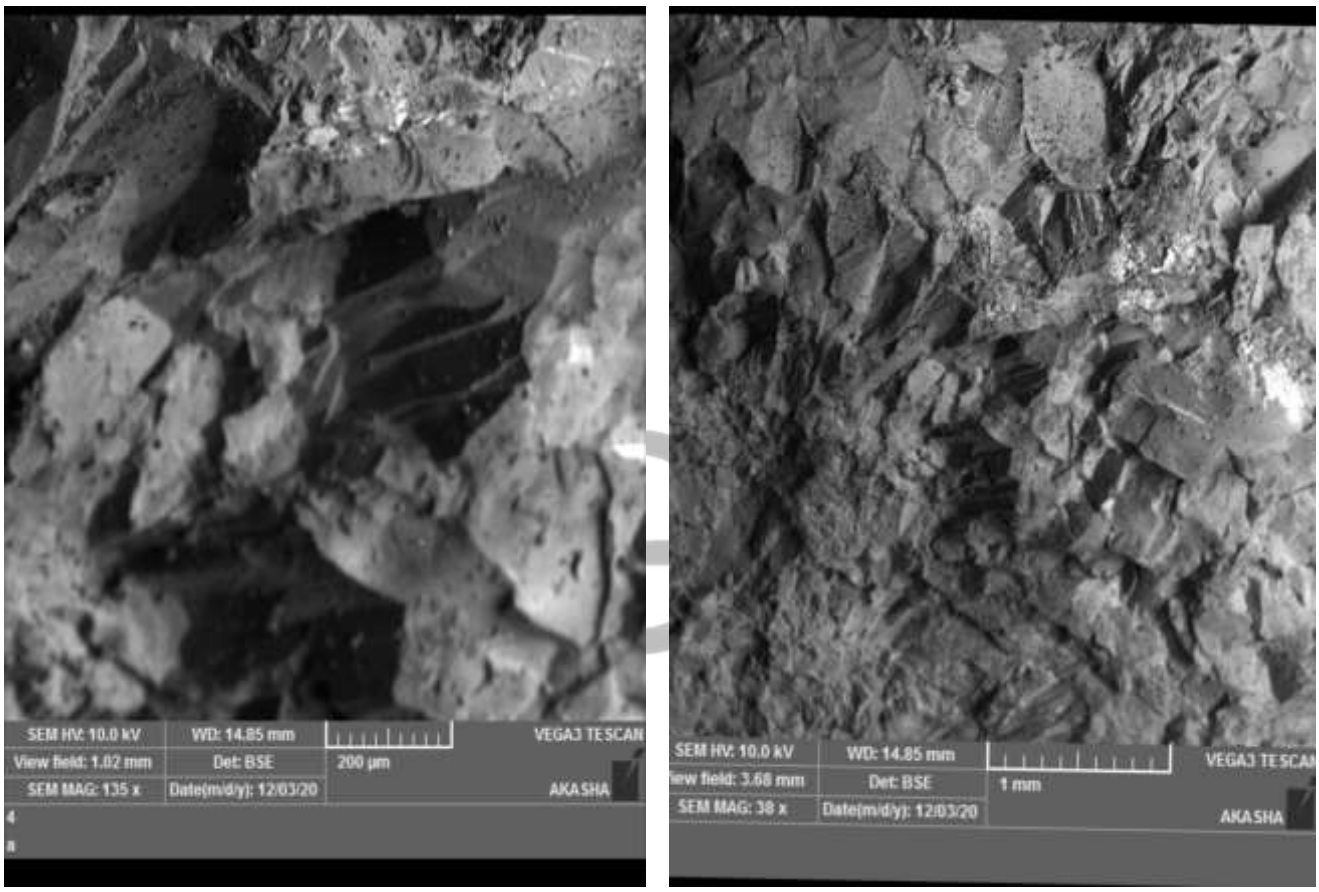
(9-10). Additionally , the band located at1645cm^{-1} is due to the vibration of the bond Si-O The generated vibrations by Al-O bonds are described by the intensity located at 1087 cm^{-1}. The allotropic phase of $SiO_2$is observed in 797 cm^{-1}.



3.1.3Scan electron microscopy:

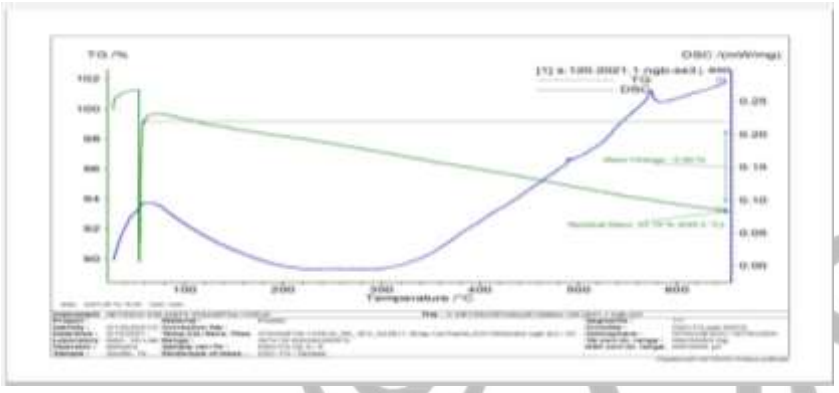
figure (5) and (6) shows the image and morphological of zeolite, the figure show the smaller particles in an amorphous of standard one, layers and sheets with allow water to pass through it

Fig(5-6)scan image



3.1.4Thermal analysis:

figure (7) show thermal analysis by (TGA) The thermal stability of the zeolite was obtained from thermogravimetric analysis (TGA) this is to measure changes in the physical and chemical properties whilst increasing temperature constantly and to obtain information about the mass loss during the thermal treatment process



3.1.5. XRF:

gives the data for chemical compositions of natural zeolite fractions which obtained from XRF analysis are given in table (1)

SiO_2	Al_2O_3	Fe_2O_3	Mg O	CaO	Na_2O	K_2O	L.O.I	
70.24	13.51	2.24	0.58	1.60	1.01	4.89	8.22	

Table (1) shows (XRF) results.

It can be seen that zeolite is rich in Si_2O.

Conclusion:

Natural zeolite have many advantages it is environmentally friendly material.

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