

Characterization and Application of Natural Zeolite Clinoptilolite Crystal Available Near Ajanta Ellora Caves

Dr.V.P.Deshpande, Prin.B.T.Bhoskar, Dr.S.B.KOLHE

Abstract— Natural Zeolite Clinoptilolite was collected near Ellora Ajanta belt.Characterization was made using XRD, IR as usual method. Application of natural zeolite Clinoptilolite was done with water and result was reported

Index Terms— Clinoptilolite,characterization, application.

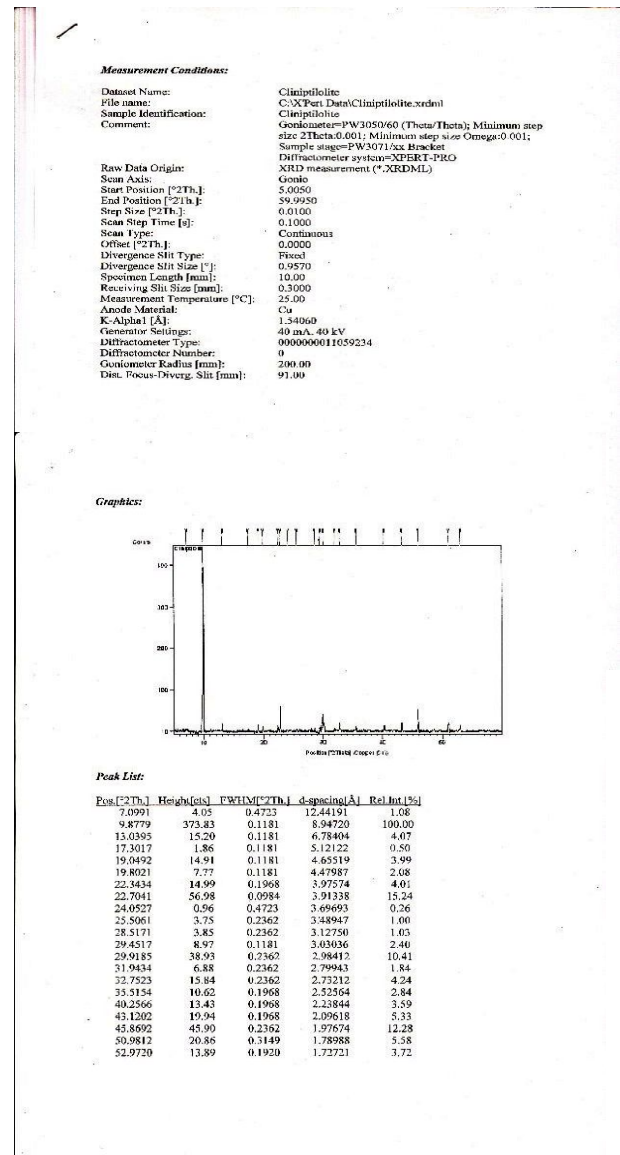
I. INTRODUCTION

Zeolites are micro porous alkaline hydrated aluminosilicate crystals, which include both natural and synthetic varieties real solutions. The idea that zeolite crystals have potential applications in numerous areas of scientific, industrial and agricultural technology has provided impetus for research and development programs that have been carried out in several countries. Industries such as paper, tanneries, textile, sugar industries, discharge toxic matter to water streams causing the pollution. These chemicals are toxic to aquatic life and other organisms responsible for self purification of streams into which liquid effluents are thrown. Recently it has been confirmed that the ion exchange properties of zeolite crystals could be used to remove certain harmful ions from these effluents. Zeolite structures are unique features that lead to unusual type of cationic selectivity and sieving. Though in Deccan trap of India, occurrence of large deposits of zeolites have been reported, such type of studies on the natural zeolites are rarely reported.Taking the advantage of different types of zeolites crystals available in this part of India that is Marathwada/Maharashtra(Particularly in the belt of Ajanta and Ellora caves, it was thought worth while to collect different varieties of zeolite crystals from the different localities where the occurrence of zeolites have not been reported so far. After rigorous survey, a few new localities of zeolites have also been found.

II. CHARACTERIZATION

physical perfection is equally important after the identity and quantity of the atoms present in a crystal, for crystal characterization. The beginning of such work is the accurate determination of structure of crystals with X-rays. These techniques, based on monochromatic X-radiation are generally more important because the dspacing can be calculated from the observed diffraction angles. For natural zeolites and synthetic zeolites, x-ray powder diffraction methods are commonly used for the structural investigations

and also for the purpose of identification. In the present investigation, the bragg diffractometer arrangement is used. The specimen in the form of micro crystalline powder is mounted in the sample holder, which is then placed at the center of the diffractometer and rotated by an angle θ around on axis in the sample plane. The counter is attached to an arm rotating around the same axis by angles twice as large as those of the specimen rotation only (hkl) planes of the microcrystals parallel to the sample plane contribute to the diffracted intensity.

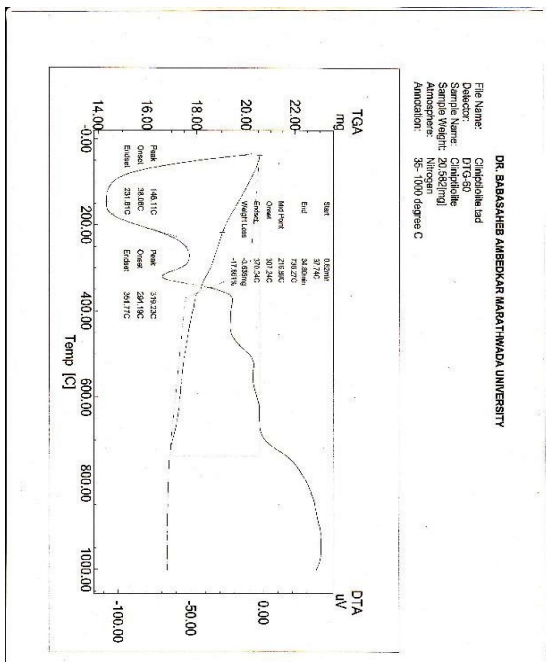
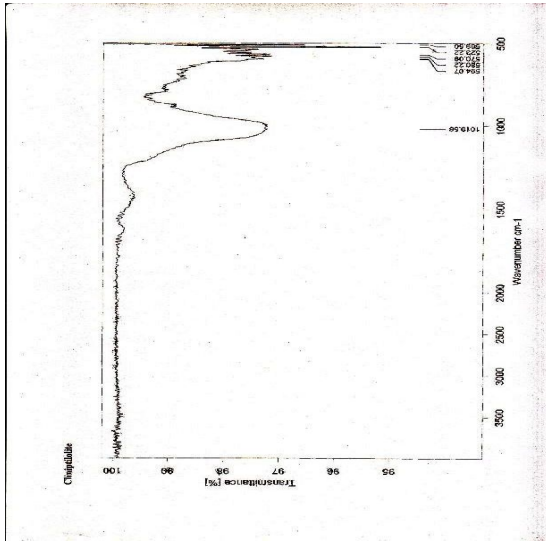


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Dr.V.P.Deshpande, Shivaji college kannad, India

Prin.B.T.Bhoskar, Nutan mahavidyala sailu, Dist.Parbhani, India

Dr.S.B.KOLHE, Shivaji college kannad, India



III. APPLICATIONS OF ZEOLITES

Applications of zeolites in different fields depends upon the several physical or chemical properties including

1. ion – exchange
2. adsorption
3. (iii)dehydration and rehydration and
4. Siliceous composition.

IV. ZEOLITE IN WATER

Filtration of Drinking Water New filters for the purification of the drinking water and industrial effluents are very important. Practically water containing suspended particles are purified by percolation through quartz sand 0.5-2 mm grain size. Quartz sand is however rather expensive and has low fine – trapping capacity. Studies have shown that quartz sand can be successfully replaced by natural zeolites, which are superior in

several ways (1,2). High porosity is advantageous as this causes high flow rates in Clinoptilolite and Mordenite water filters. Mud trapping capacity of zeolite is higher than with the quartz sand.

V. ZEOLITE IN FISH POND

Development of fish ponds invokes complex problems associated with creation of optimum conditions for breeding. One of the most important problem is removal of ammonia from the water as ammonia is a cause of mass mortality of fish. The sorption method has proved to be best for removal of ammonium ions. Natural zeolites are widely used for purification of polluted waters in the USA and Japan. Experience regarding the productivity of ponds or fish breeding is of interest. In a 45000-dm3 pond containing some 2000 of breeding fish, the yield increases by about three times when the water is purified of ammonium ion. Removal of NH4 ions from waste water using natural zeolite was studied in detail earlier (3) In present application clinoptilolite is used for water purification .Two samples of one liter of water was used. One was with filter and other was without filter.Result of analysis is shown below.

Government of Maharashtra
Water Resources Department
Hydrology Project
WATER QUALITY LABORATORY (LEVEL-II), AURANGABAD
(ISO 9001 : 2008 CERTIFIED)

Ref. No. : WQA/L-11/AAB/1
Date : 12/09/2011

Dr. Shripande Vishwamver Prabhakarao,
Head of Dept. of Physics,
Shivaji College, Kannad,
Aurangabad.

Subject: - Analysis Report
Ref: - Your Letter Dated: - 12/09/2011
Sir/Madam,
Please find Sample Analysis Report for the sample submitted alongwith desired parameters

Water Analysis Report

1. Nature of Sample: Filter Water (Kannad) 2. Date of Sampling: 12-09-2011
3. Date of receipt of Sample: 13-09-11 4. Sample Collected By: V.P. Deshpande

Sr. No.	Parameters	Results	Units
Physicochemical Analysis			
1	pH	8.2	
2	Electrical Conductivity	460	µmhos/cm
3	Dissolved Oxygen	6.4	mg/L
4	Total Suspended Solids	2	mg/L
5	Total Dissolved Solids	342	mg/L
6	Total Solids	342	mg/L
7	Turbidity	34.2	mg/L
8	Alkalinity	1	NTU
9	Chloride	172	mg/L
10	Sulphates	28	mg/L
11	Fluorides	0.23	mg/L
12	Calcium	38	mg/L
13	Total Hardness	212	mg/L
14	Sodium	23	mg/L
15	Phosphorus	4.8	mg/L
16	Nitrate	3.32	mg/L
17	Ammonia	ND	mg/L
18	Aluminum	ND	mg/L
19	Iron	0.1	mg/L
20	Silica	36	mg/L
21	Magnesium Hardness	116	mg/L
22	Magnesium	28	mg/L

Yours faithfully,
Government Analyst
Water Quality Lab Level-II, Aurangabad

NOTE:
1. The result listed refers only to the tested sample(s) and applicable parameters(s).
2. This report is not to be reproduced except in full, without written approval of the laboratory.

Test Water For Healthy Life.

Government of Maharashtra
Water Resources Department
Hydrology Project

WATER QUALITY LABORATORY LEVEL - II, AURANGABAD
(ISO 9001 : 2008 CERTIFIED)

Web: www.wqlab.org Email: wqlab@rajil.com, info@wqlab.aurangabad@mahabp.org

Ref. No: WQLAB L-II/ABD/
To, Deshpande Vishwamier Prabhakarao,
Head Dept. of Physics,
Shriji College, Karnad,
Aurangabad.
Subject: Analysis Report
Ref- Your Letter Dated- 12/09/2011
Sl: (N/A)
File: s Find Sample Analysis Report for the sample submitted alongwith desired parameters

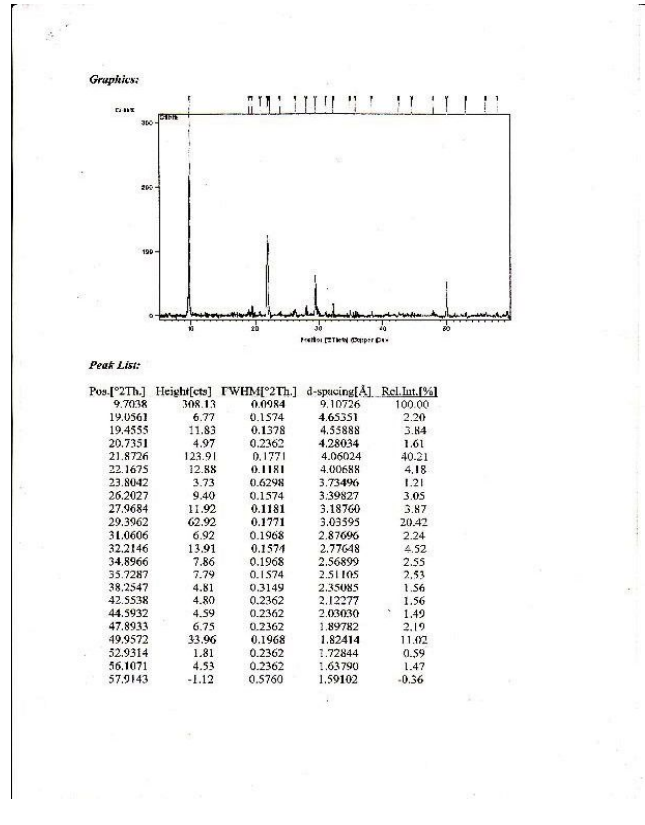
Water Analysis Report

1. Nature of Sample: Raw Water (Kannad) 2. Date of Sampling: 12-09-2011
3. Date of receipt of Sample: 13-09-11 4. Sample Collected by: V.P. Deshpande

Sl. No.	Parameters	Results	Units
Physicochemical Analysis			
1	pH	8.1	
2	Electrical Conductivity	452	µmhos/cm
3	Dissolved Oxygen	6.3	mg/L
4	Total Suspended Solids	4	mg/L
5	Total Dissolved Solids	342	mg/L
6	Total Solids	346	mg/L
7	Turbidity	4	NTU
8	Alkalinity	164	mg/L
9	Chloride	26	mg/L
10	Sulphate	27	mg/L
11	Fluoride	0.41	mg/L
12	Calcium	40	mg/L
13	Total Hardness	502	mg/L
14	Sodium	22.8	mg/L
15	Potassium	3.2	mg/L
16	Nitrate	3.34	mg/L
17	Ammonia	ND	mg/L
18	Aluminium	ND	mg/L
19	Iron	0.17	mg/L
20	Silica	16	mg/L
21	Magnesium Hardness	92	mg/L
22	Magnesium	22	mg/L

V.P. Deshpande
Government Analyst
Water Quality Lab Level-II, Aurangabad

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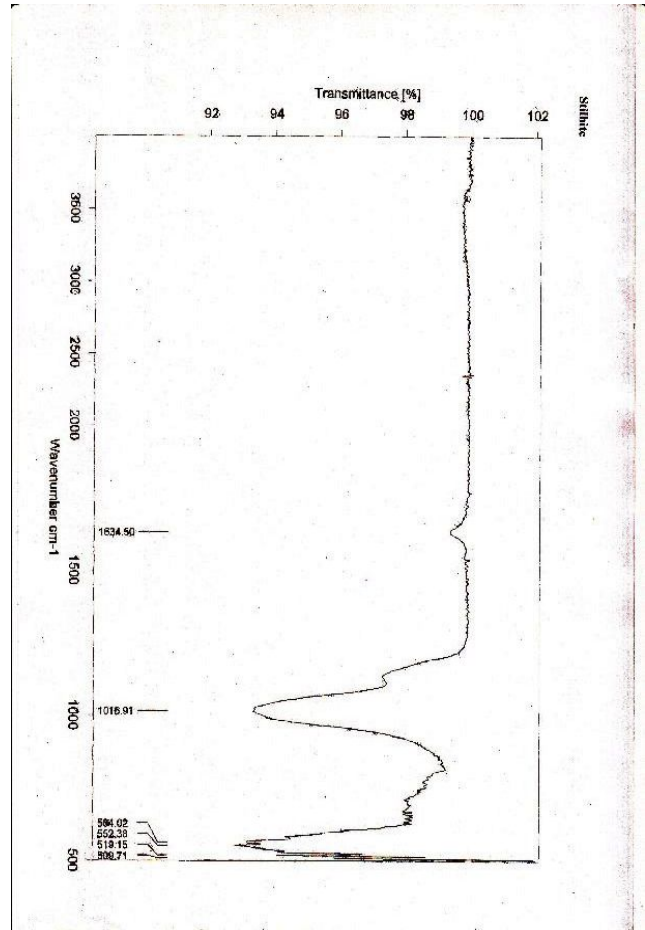


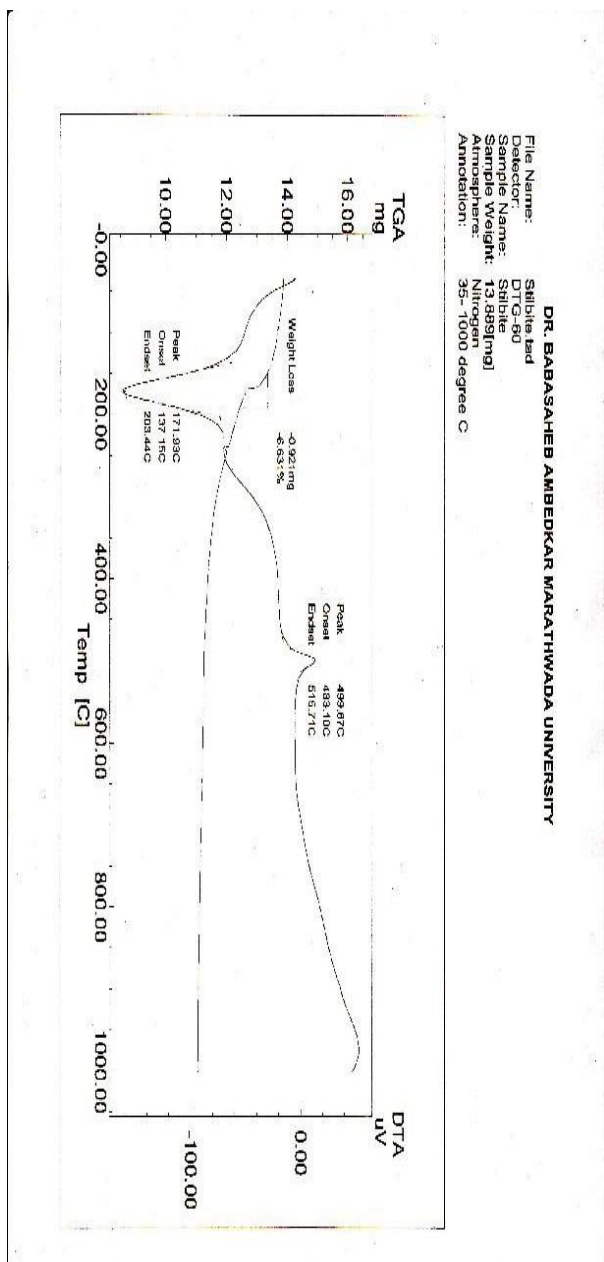
Test Water For Healthy Life.

Measurement Conditions:

Dataset Name: Siltite
File name: C:\XPert Data\Siltite.rxdml
Sample Identification: Siltite
Comment: Goniometer: PW305060 (Theta/Theta); Minimum step size 2 Theta: 0.001; Minimum step size Omega: 0.001
Sample stage: PW3071sc Bracket
Diffractometer system: XPERT-FRO
3θθ measurement (°/XRDMT)

Raw Data Origin: Goni
Scan Axis: Goni
Start Position [2Th.]: 5.0050
End Position [2Th.]: 59.9950
Step Size [2Th.]: 0.0100
Scan Step Time [s]: 0.1000
Scan Type: Continuous
Offset [2Th.]: 0.0000
Divergence Slit Type: Fixed
Divergence Slit Size [°]: 0.9570
Specimen Length [mm]: 10.00
Receiving Slit Size [mm]: 0.3000
Measurement Temperature [°C]: 25.00
Anode Material: Cu
K-Alpha [Å]: 1.54060
Generator Settings: 40 mA, 40 kV
Diffractometer Type: 000000011059234
Diffractometer Number: 0
Goniometer Radius [mm]: 200.00
Dist. Focus-Diverg. Slit [mm]: 91.00





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CONCLUSIONS

Natural zeolite Clinoptilolite was collected from Ajanta caves.Characterization was made by XRD,FTIR,TG/DTA method.Zeolite clinoptilolite is used for water purification,results are as follows

- DISSOLVED OXYGEN INCREASE
- TURBIDITY DECREASE
- CHLORIDE DECREASE
- CALCIUM DECREASE
- IORN DECREASE
- POTASSIUM DECREASE
- NITRATE DECREASE
- CALCIUM DECREASE

This shows that zeolites are best purifier of water.