GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[x] ORIGINAL [ ] REVISION NO. _____

Project No. A-3787 — GTRI/~~GTRI~~ — DATE 3 / 20 / 84

Project Director: Dr. T. L. Thomas — ~~School~~/Lab EMSL

Sponsor: ATEC, Inc.
Riverton, WY 82501

Type Agreement: Research Project Agreement No. A-3787

Award Period: From 3/7/84 To 6/6/84 (Performance) 6/6/84 (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated: $		$ 1,489
Funded: $		$ 1,489

Cost Sharing Amount: $ _____ Cost Sharing No: _____

Title: "Determination of Absorption Capacity and Rate for Zeolite Samples"

ADMINISTRATIVE DATA — OCA Contact Lynn Boyd x4820

1) Sponsor Technical Contact:

Mr. Berto Berti
ATEC, Inc.
625 E. Madison Avenue
Riverton, WY 82501
(307) 856-1760

2) Sponsor Admin/Contractual Matters:

Defense Priority Rating: n/a — Military Security Classification: n/a
(or) Company/Industrial Proprietary: n/a

RESTRICTIONS

See Attached ---- Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval -- Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with sponsor; but none proposed.

COMMENTS:

50% paid by advance payment (check no. 0481 dtd. 3/8/84.) Other 50% will be due and paid upon completion of project.

COPIES TO:

I.D. No. 01.200.000.84.007

Project Director	Procurement/EES Supply Services	GTRI
Research Administrative Network	Research Security Services	Library
Research Property Management	Reports Coordinator (OCA)	Project File
Accounting	Research Communications (2)	Other NEWTON

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 8/13/84

Project No. A-3787 ~~School~~/Lab EMSL

Includes Subproject No.(s)

Project Director(s) Dr. T. L. Thomas GTRI / ~~GIT~~

Sponsor ATEC, Inc.

Title Determination of Absorption Capacity and Rate for Zeolite Samples

Effective Completion Date: 6/6/84 (Performance) 6/6/84 (Reports)

Grant/Contract Closeout Actions Remaining:

- [ ] None
- [x] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other

Continues Project No. Continued by Project No.

COPIES TO:

Project Director (Thomas)
Research Administrative Network
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Other I. Newton

Form OCA 60:1028

Georgia Institute of Technology
ENGINEERING EXPERIMENT STATION
Atlanta, Georgia 30332
March 22, 1984

Mr. Berto Berti, Vice President
ATEC, Incorporated
625 E. Madison Avenue
Riverton, WY 82501

RE: Monthly Letter Report #1
Period 3/7/84 - 3/23/84
Determination of Adsorption Capacity
and Rate for Zeolite Samples

Summary:

(1) McBain-Bakr system assembled and vacuum tested.

(2) Received zeolite samples from ATEC.

Key Elements for Next Period:

(1) Calibrate and check out McBain-Bakr system.

(2) Run water isotherms and rates of adsorption on each of 3 samples as advised by ATEC.

(3) Run water equilibrium capacity at 25° C on each of 6 samples as advised by ATEC.

Sincerely,

T. L. Thomas, Head
Zeolite Research Program
Energy and Materials Sciences
Laboratory

TLT:gb

Final Report for

Determination of Adsorption Capacity and Rate for Zeolite Samples

to

ATEC, Inc.

June 8, 1984

Proposal No. ME-OD-2356

Georgia Institute of Tecnology
Engineering Experiment Station
Energy and Material Sciences Laboratory
Atlanta, Georgia 30332

Partial results from this investigation were transmitted to Mr. Berti by telephone on May 2 and 16, 1984 and by Federal Express on May 29, 1984. All of the work requested by ATEC under this contract has been completed and is presented in its entirety in this report.

1. Adsorption Isotherms

Isotherms for water at 25°C have been run on ATEC samples VC, ZN and BI simultaneously with a commercial sample of Union Carbide Type 4A, 1/8-inch pellets. These results are given in Figure I in linear scale and in Figure II in semi-logarithmic scale.

2. Rate of Adsorption

Rates of adsorption of water at saturation and 25°C were run on ATEC samples VC, ZN and BI simultaneously with a commercial sample of Union Carbide Type 4, 1/8-inch pellets as a standard. These results are presented in Figure III.

3. Adsorption Capacity

Water equilibrium capacity at 25°C and 17.5 mmHg pressure was measured on the following ATEC samples and Union Carbide Type 4A, 1/8-inch pellets. All samples reached equilibrium within the 18 hours allowed.

Sample	AI	13.2 wt. %
	ZC	22.5
	OE	14.7
	AS	9.6
	BD	18.3
	ED	14.5
Type 4, 1/8-inch pellets		23.9

4. High Temperature Adsorption

Water adsorption equilibrium at 500°F was measured

for ATEC sample BI along with Union Carbide Type 4A, 1/8-inch pellets as a standard with the following results:

Pressure (psia)	BI	Type 4A
1.2×10^{-3}	0.075 wt. %	0.43 wt. %
0.9×10^{-2}	0.43	1.43
1.02×10^{-1}	1.43	2.57

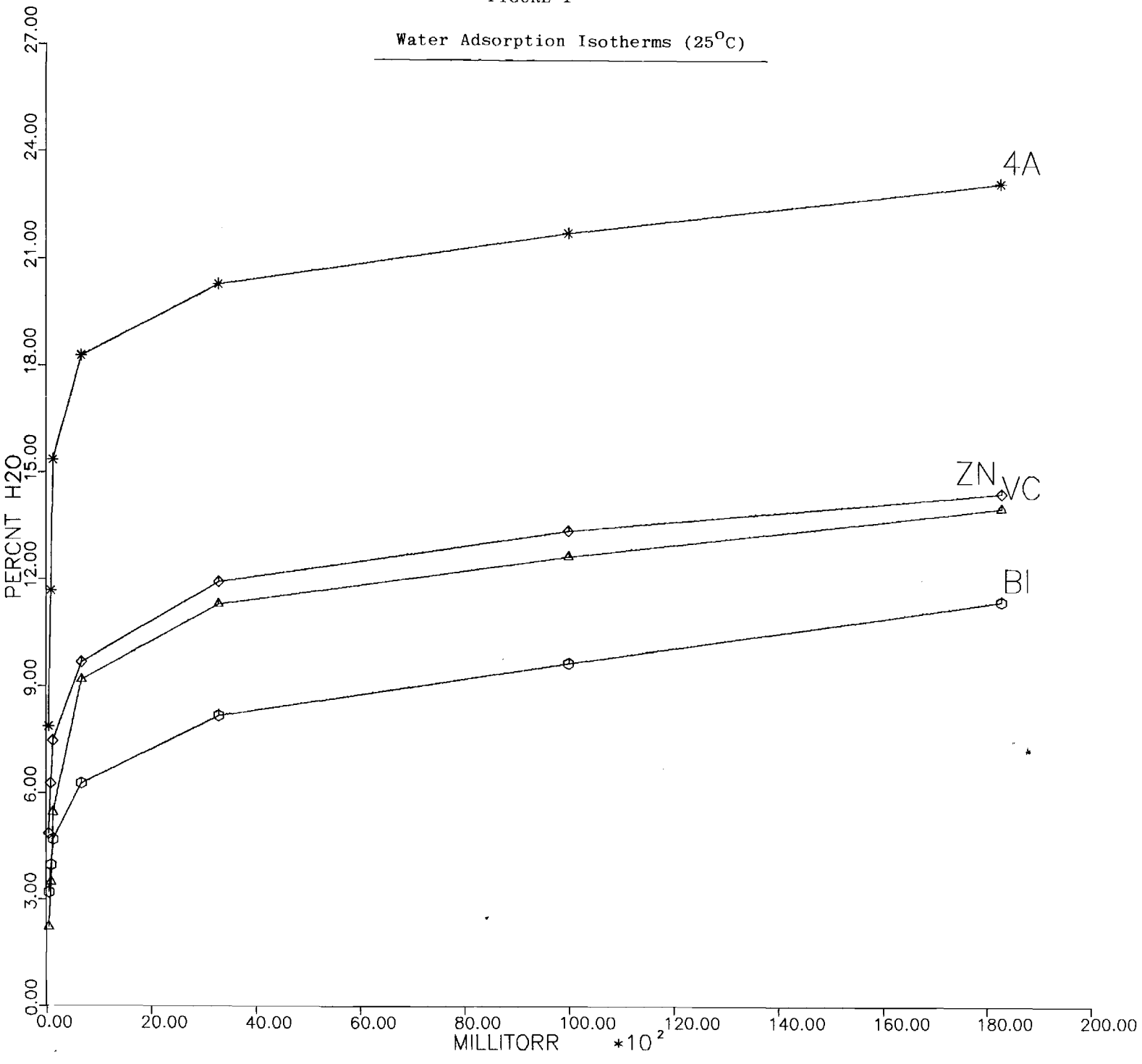
5. X-Ray Data

X-ray diffraction patterns were obtained for ATEC samples VC, BI and AI. The principal peak for clinoptilolite at 2 theta values of 23.5 appears weak in all three cases. Since we do not presently have an internal standard (pure clinoptilolite), no assessment can be made of the amount of clinoptilolite in each sample; however, based on an assumed value of 100% for sample VC, BI would contain 70% clinoptilolite and AI would contain 63%. It should be noted that AI has two very strong lines at 2 theta values of 26.7 and 61.1 indicating the presence of a second crystalline material. VC and BI appear to be clean of any significant extra crystalline materials. X-ray patterns for VC, BI and AI are attached here.

It should be noted that all ATEC samples and the Type 4A pellets were activated at 350°C under high vacuum. The ATEC samples continued to outgas after 18-24 hours indicating impurities, probably carbonates, were present in the samples. For the purposes of this reported work, we heated all samples under high vacuum at 350°C for 2 hours and defined the resulting weight as the "activated weight."

FIGURE 1

Water Adsorption Isotherms (25°C)



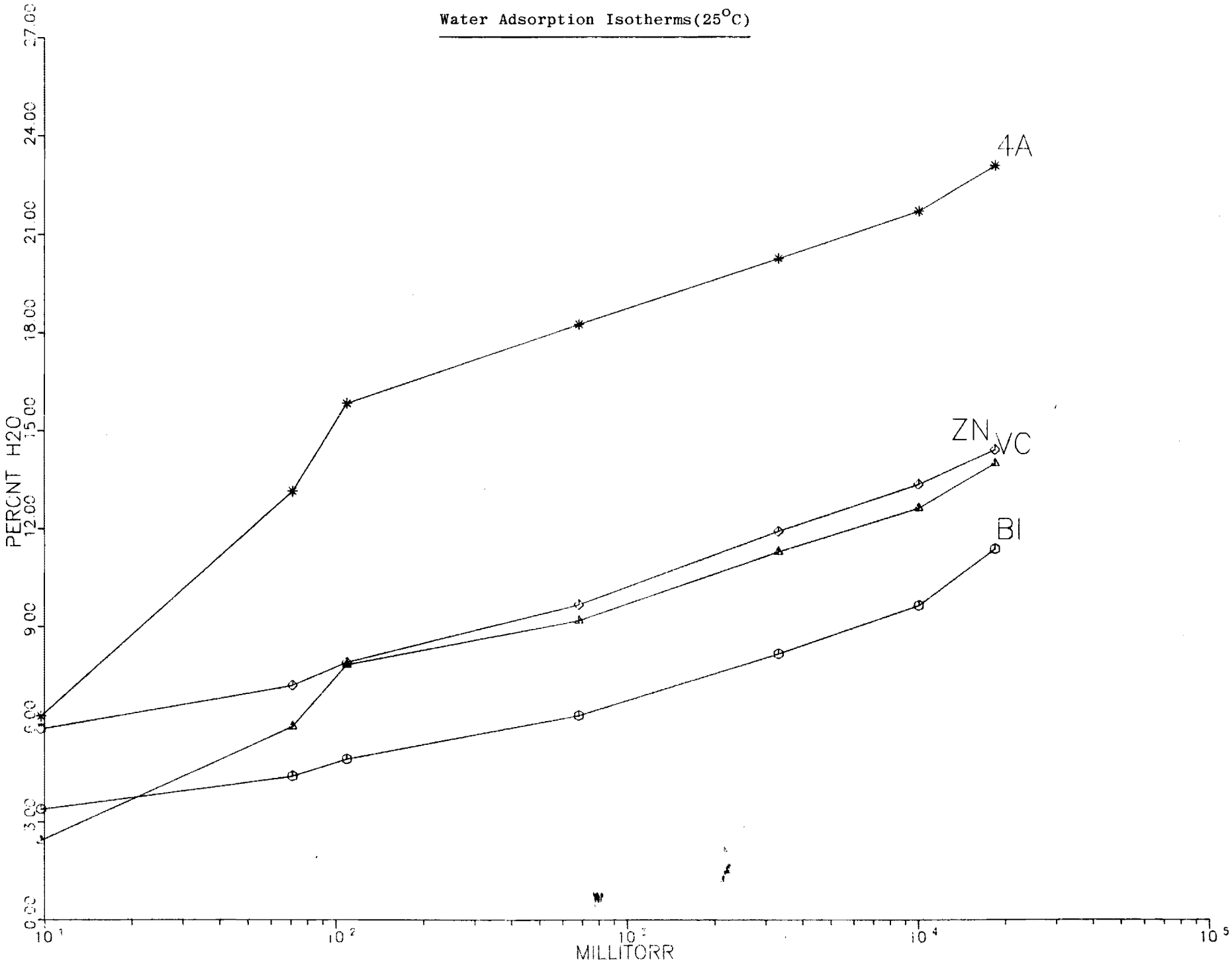

Water Adsorption Isotherms(25°C)
PERCNT H2O
27.00
24.00
21.00
18.00
15.00
12.00
9.00
6.00
3.00
0.00
4A
ZN VC
BI
10 1
10 2
10 3
10 4
10 5
MILLITORR

FIGURE III

Rate of Water Adsorption (25°C)