308 --- Q200507140001

Scientific Notebook No. 710: Radionuclide Transport (RT) Key Technical Issue - Continuation of Scientific Notebook No. 631 (05/03/2005 through 06/15/2005)

LABORATORY NOTEBOOK

710

CNWRA/SwRI

NOTEBOOK NO. 710
ISSUED TO BRADLEY WERLING 210-522-6565
ON 5-2-2005 20____
DEPARTMENT DIV 20
RETURNED _____ 20____

CNWRA
CONTROLLED
COPY 710

Radionuclide Transport in the Saturated Zone 20.06002.01.242 and the Unsaturated Zone 20.06002.01.232

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BRADLEY WERLING	Bradley Werling	BAW	
Marla Roberts	Marla Roberts	MR	

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Initial Entry for Scientific Notebook 710

This notebook contains work for Radionuclide Transport (RT) in both the saturated zone and unsaturated zone (ISIs 20.06002.01.242 and 20.06002.01.232 respectively). RT is concerned with identification of key geochemical processes that may control radionuclide transport at Yucca Mountain. Radionuclide retardation is dependent on the hydrochemistry and mineralogy along the groundwater flow paths from the proposed repository. Typical activities associated with these investigations would include conducting laboratory batch sorption experiments, collecting field samples, and analyses of field samples.

Current experimental activities are focused on characterization of materials collected from the Yucca Mountain region and laboratory batch sorption experiments that incorporate these materials. Current alluvium characterization work will focus on XRF, XRD, and surface area analyses of sonic core samples. The objective for a sorption experiments is to determine the sorption capability (Kd or sorption coefficient) for a particular radionuclide, solid material, and solution typically over a range of pH values. Tasks typically include the following:

- Preparation of reference solutions.
- Cation (Div 01), inorganic carbon (CNWRA) and pH analyses (CNWRA) of reference solutions.
- Preparation of experimental solutions
- Liquid Scintillation Analyses (CNWRA) of experimental solutions.

Further details of these tasks are recorded in initial and in-process entries.

This scientific notebook (SN) is a continuation of SN 631. That notebook concludes with the sieve analysis of NC-EWDP-22PC Sonic Core Samples.

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Continuation From SN 631 of Sieve Analysis of NC-EWDP-22PC Sonic Core Samples

Original Initial Entry: 631/72-73

Personnel initially involved: Marla Roberts

Objectives
The sieving of the samples is conducted with three objectives:
- To characterized the sonic core samples by quantifying the amount of material in various mesh ranges
- To divide the sample into various mesh ranges in preparation for XRD, XRF, and surface area analyses.
- To create a subsample of material less than mesh 35 for potential use in sorption experiments

Samples
59 samples from NC-EWDP-22PC labeled as NC-EWDP-22PC-0305-"interval" from 631/67-68
- Initial collection at SMF 631/55-64
- Receipt at CNWRA 631/66

Equipment
- Sartoruis Scale - Model 3808MPS-IV20, serial # 39030006
- Ro-Tap machine - Model-B Spec # 34C63-5506 Combustion Engine

Supplies
- Sieve brushes
- Spatula
- Ziplock bags
- Various sizes of polystyrene bottles
- U.S.A Standard Test Sieve, ASTM E-11 Specification, from Fisher Scientific mesh #s 5, 10, 35, 100, 200, 325, and bottom pan
- Surface protector paper
- Weighing paper

Procedure

Each sample will be individually sieved for 15 minutes on the Ro-Tap machine using mesh #s 5, 10, and 35. This will divide the sample into four groups: greater than (>) mesh # 5, between mesh #s 5 and 10, between mesh #s 10 and 35, and less than (<) mesh # 35. A piece of surface protector paper will be placed on the scale and tared. The material from each mesh range will be individually placed on the scale and the mass will be recorded. The material from the three mesh ranges with the largest size material (>5, 5-10, and 10-35) was temporarily transferred into separate ziplock bags. These three bags were placed inside the original ziplock bag for that particular sample. In the future, the material from these three mesh ranges groupings may be recombined into one subsample. For now there are kept separate because aliquots from these specific mesh ranges may be sampled for analyses.

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Aliquots for XRD and XRF analyses were collected from the less than (<) 35 material portion. The less than (<) 35 material was placed on a piece of surface protector paper. The sample was then quartered. Ideally, the XRF and XRD samples would come from different quarters, but this may not be possible base on the amount of material present. About 10 grams was removed from one quarter portion for XRD and about 15 grams was removed from a different quarter portion for XRF analyses. A polystyrene bottle was placed on the scale and tared. Once the appropriate amount of material was added, the mass was recorded. The polystyrene bottle was then appropriately labeled. The label prefix "22" represents the well ID - NC-EWDP-22PC. The label suffix represents the actual analyses performed: "F" for XRF and "D" for XRD. The middle number of the label represents the sample interval depth. A single number (depth) was selected within the original sample interval range that did not overlap with any other sample interval range.

After the XRF and XRD sampling was finished, the remaining portion of the less than (<) 35 material was transferred into a single polystyrene bottle. These bottles were labeled like the original samples (ie NC-EWDP-22PC-0305-462.0-462.9) with the suffix "<#35" added. More characterization of the less than (<) 35 portion is planned by further quantifying the amount of material in even smaller mesh ranges (100, 200, and 325). Also, surface area analyses of the less than (<) 35 portions is planned. These other characterizations would occur after this initial sieving process is completed. CNWRA staff want to send the XRF and XRD samples to the other labs for analyses as quickly as possible.

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From Page No. 3 May 2005 MR

see initial entry: 710 / 2-3

*Sample prefixes: NC EWDP 22PC 0305

Sieve Analysis – Grain Distribution of Sonic Core Samples – NCEWDP 22PC 0305

ID	3 May 05 MR ~~M5~~ Mass(g) >#5	Mass(g) #5-#10	Mass(g) #10-#35	Mass(g) <#35-Pan
653.1-654.5	188.6	95.3	151.2	105.2

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Aliquot Removal from <#35 for XRD & XRF Analysis

XRF Aliquot		XRD Aliquot	
Sample ID	Mass(g)	Sample ID	3 May 2005 MR ~~MA~~ Mass(g)
22-653-F	15.2	22-653-D	10.2

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*sample prefixes: NC-EWDP-22PC-0305

Sieve Analysis - Grain Distribution of Sonic Core Samples - NC-EWDP-22PC-0305

ID	Mass(g) >#5	Mass(g) #5-#10	Mass(g) #10-#35	Mass(g) <#35-Pan
700.9-702.1	279.0	47.7	67.6	68.1
721.5-722.3	246.8	57.9	79.6	96.2
686.1-687.4	306.8	64.3	100.1	93.3
471.3-473.2	148.5	116.0	192.4	62.5

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Aliquot Removal from <#35 for XRF + XRD Analysis

see initial entry 710/2-3

XRF Aliquot Sample ID	Mass(g)	XRD Aliquot Sample ID	Mass(g)
22-701-F	15.2	22-701-D	10.1
22-722-F	15.0	22-722-D	10.0
22-686-F	15.0	22-686-D	10.0
22-472-F	15.1	22-472-D	10.0

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see initial entry: 631/67-68

Recorded weights of oven dried samples-NCEWDP22PC

sample prefixes: NC-EWDP-22PC-0305
measured mass is without bag weight of ~ 12.7g

ID	Mass (g) after oven dried	date dried
747.4-748.8	458.7	3 May 05
614.1-615.5	526.2	3 May 05
471.3-473.2	520.6	3 May 05
4 May 05 MR 476.9-478.5	515.6	3 May 05
539.2-540.8	432.8	3 May 05
618.5-620.5	635.1	3 May 05
715.0-717.1	488.7	3 May 05
760.3-761.6	581.5	4 May 05
555.3-556.8	462.4	4 May 05

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see initial entry: 710/2-3
*sample prefixes: NC-EWDP-22PC-0305

Sieve Analysis-Grain Distribution of Sonic Core Samples-NCEWDP22PC 0305

ID	Mass (g) >#5	Mass (g) #5-#10	Mass (g) #10-#35	Mass (g) <#35
760.3-761.6	316.4	46.3	114.1	103.5
555.3-556.8	129.7	92.4	174.9	63.8
747.4-748.8	180.5	89.4	119.0	65.1
618.5-620.5	234.7	117.6	188.8	93.7
715.0-717.1	297.3	45.3	67.2	79.4
740.5-742.5	711.6	57.7	95.5	102.1
614.1-615.5	156.5	113.5	148.0	99.0
5 May 05 MR ~~35~~ 476.9-478.5	257.3	74.0	106.3	78.1
539.2-540.8	188.3	78.0	110.2	116.3

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See initial entry: 710/2-3

Aliquot Removal from <#35 for XRF & XRD Analysis

XRF Aliquot		XRD Aliquot	
Sample ID	Mass(g)	Sample ID	Mass(g)
22-760-F	15.0	22-760-D	10.0
22-555-F	15.2	22-555-D	10.0
22-748-F	15.1	22-748-D	10.0
22-619-F	15.0	22-619-D	10.2
22-716-F	14.9	22-716-D	10.1
22-741-F	15.0	22-741-D	10.0
22-614-F	14.9	22-614-D	10.1
22477-F	15.1	22477-D	10.0
22-540-F	15.1	22-540-D	10.1

Recorded weights of oven dried samples: NCEWDP22PC 0305

See initial entry: 631/67-68; ID prefix: NCEWDP22PC0305
sample weight is without weight of bag: 12.7g

Sample ID	Mass(g) after oven dried	date dried
740.5-742.0	568.3	5 May 2005

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See initial entry 631/72-73
* re-weighed <#35 for 694.3-695.6, see below

Aliquot Removal from <#35 for XRF & XRD

XRF Aliquot		XRD Aliquot	
Sample ID	Mass(g)	Sample ID	Mass(g)
22-~~6946~~ 695-F (12 May 05)	15.2	22-~~6946~~ 695-D (12 May 05)	10.2

Mass(g) <#35 - Pan
60.9

Initial recorded mass (g) for 694.3-695.6 <#35 (631/73) was incorrect. The value recorded was the mass (g) of the empty polystyrene vial. Error was caught when sample masses (g) were input into the electronic database. The mass (g) of the <#35 portion was measured and recorded on 710/11. Masses (g) for the other 3 mesh ranges (>#5, #5-#10, and #10-#35) for this sample were reweighed and determined to be initially recorded accurately on 631/73.

Not all 59 samples from, NC-EWDP-22PC-0305 (631/ 67-68), were dried. Only samples showing visible condensation on the interior of the Ziploc bags were oven dried. For samples that required drying, the sieving analysis was performed after the samples were dried.

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Creation of three known standards to include in group of XRD samples

Three known standards are included in the group of samples being sent out for XRD analysis to determine the validity of the lab results. The first standard is 99a Sodium Feldspar and the other two are mixes of various minerals explained below.

Mix 1 and Mix 2 labeled 22-769-D and 22-773-D respectivly, consist of four separate mineral fractions. These two standards consist of Quartz (W510 * 60/100 * UC * RC * 5-10-05 RFe * HL, 365/19), Clinoptilolite (CDV * 200/325 * UC * WA * RL * HL * RFe (420/63), Montmorillonite (SAz-1) (Sity of Missouri-Columbia, Source Clay Minerals Repository, Arizona), Calcite 5-10-05 (Sa 309/146).
The weights of each mineral fraction contained in each of the two mixes can be found on 7/10/13

Weighing of standard material fractions (ID's 22-769-D and 22-773-D

The material fractions of the three standards included in the set of XRD samples to be sent off for analysis with the 2005 EWDP-22PC samples were weighed on the Mettler Toledo PR 5002 scale (SN 1122142730). Each mineral fraction was weighed individually then combined and stored in a 15 dr plastic container

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Fraction weights of two mix standards for XRD analysis, ID's 22-769-D, 22-773-D

Mineral	Mix # 1 ID: 22-769-D Fraction Weight (g)	Mix # 2 ID: 22-773-D Fraction Weight (g)
Quartz	4.00	6.00
Montmorillonite	2.00	1.00
Clinoptilolite	2.00	4.00
Calcite 5-10-05	1.00	0.50
Total	9.00	11.50

Table of XRD Standard Sample Original label, New label and weight

Original ID	New ID For XRD analysis	Sample weight (g)
99a Sodium Feldspar	22-764-D	5.00
Mix 1 (reference 7/10/12)	22-769-D	9.00
Mix 2 (reference 7/10/12)	22-773-D	11.50

5/11/05 [illegible]

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Creation of 3 known standards to include in XRF samples

These known standards are created and included in the 59 sieve samples being sent out for XRF analysis ~~CCP~~ 5/11/05
(EWDP-22PC samples).
Each standard is ~10 g.
NBS = National Bureau of Standards
~~BGM~~ 5/11/05

		New ID
NBS 70a	= Potassium Feldspar	22-765-F
NBS 99a	= Sodium Feldspar	22-768-F
NBS 278.	= Obsidian Rock	22-774-F

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Surface Area Analysis of NC-EWDP-22PC-0305 Sonic Core Samples

Personnel initially involved: Marla Roberts

Objectives: Determine surface area of 59 NC-EWDP-22PC-0305 sonic core samples.

Samples: 59 samples from NC-EWDP-22PC-0305 labeled as NC-EWDP-22PC-0305-"interval" <#35 from 631/72-95 and 710/2-11. Only <#35 was used.

Equipment: Surface Area Analyzer, Coulter, SA 3100
Mettler AE240 Balance, Serial Number 101237
Okidata, Microline 390 Plus, 24 Pin Printer

Supplies: Liquid Nitrogen
Helium-Zero Grade
Compressed Nitrogen-UHB
Spatulas
Loading Funnel
Weighing Paper
3cc to 9cc Glass Sample Tube
Glass Stirrers
Tube Caps
NIST 1899 Silicon Nitride Surface Area ($10m^2/g$)
Lubricant DOW Corning High Vacuum Grease

16 May 05 MR
See initial entry 710/18-19

Basic Outline Procedure:

Prior to using the Surface Area Analyzer, Coulter, SA 3100 the O-rings are checked for integrity. The O-rings are replaced if brittle or cracked. Otherwise, O-rings are lubricated. After checking the machinery, the gas cylinders containing Helium and Nitrogen are turned so the valve is fully opened and then turned back a quarter turn. The surface area analyzer is challenged using a known surface area standard, NIST 1899 Silicon Nitride Surface Area ($10m^2/g$).

Three samples can be analyzed at a time in the surface area analyzer.

Each tube with glass stirrer and cap is weighed and the mass (g) is recorded. Approximately 1.7 – 2.0 g of sample is removed from <#35. The sample aliquot mass (g) is recorded. The aliquot is placed in tube using a loading funnel. The cap is replaced on tube and taken to the surface area analyzer. Before placing the sample in the analyzer sample information must be entered into the machine software on the 'Sample Information' screen. The sample information needed will be: the sample ID, operator, and the sample weight. Repeat three times to run surface area analyzer at capacity.

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To insert samples into surface area analyzer loosen the knurled nut on the outgas port. Remove the cap from sample tube, then insert the tube onto the outgas port until it stops against the manifold. Tighten the knurled nut until finger tight.

Now go to 'Outgas' screen. Press 'Outgas Temperature' and 'Outgas Time' to change the value displayed. The value for Outgas Temperature = 350 and Outgas Time = 720 minutes. Now press 'Start.'

Once the analysis is complete, remove the sample and promptly replace cap for sample tube. The tube is reweighed and the mass (g) is recorded. Outgas weight is found and recorded. The outgas weight is the mass (g) after outgasing minus the mass (g) of the tube with glass stirrer and cap recorded earlier.

Individual outgased samples are reloaded into surface area analyzer. On the 'Sample Information' screen change sample weight value to the outgas weight. Liquid Nitrogen is added to dewar and loaded onto the surface area analyzer. The analysis proceeds automatically.

At the completion of the analysis the results are displayed on the screen for about 2 minutes. Prompts will alert operator to remove the dewar and the sample. A paper report is printed. Additional outgased samples are placed in surface area analyzer one at a time.

16 May 05 MR
See initial entry 710/18-19

*Sample prefixes: NG-EWDP-22PC-0305
"ID" is same identification number used in the XRF, XRD analysis 631/70-71.

interval	ID	Tube, Stirrer + Cap Mass (g)	Aliquot Mass (g)
555.3-556.8	555	29.3265	12 May 05 MR 2.0048
640.3-641.4	640	29.42439	1.8103 → Aliquot taken and discarded 1.75701
694.3-695.6	695	29.8203	16 May 05 MR 1.7227

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*initial entry 710/15-16 was revised. The new initial entry can be found on 710/18-19. In addition the samples recorded on 710/16 have also been revised and re-entered 710/20 to fit into new table format, and correctly identify sample IDs.

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Surface Area Analyses of NC-EWDP-22PC-0305 less than (<) Mesh # 35 Sonic Core Samples

Personnel initially involved: Marla Roberts and Jon Brown

Objectives: To characterize alluvium in the Forty Mile Wash area of the Yucca Mountain region by determining the surface area of a particular grain size range (< mesh#35) from sonic core samples collected from NC-EWDP-22PC.

Samples: The 59 samples analyzed were the less than (<) mesh # 35 subsamples derived from the sonic core collected from the May 2005 sampling event described in 631/55-64. The samples that were analyzed were labeled "NC-EWDP-22PC-0305-XXX,<#35 mesh" where XXX represents the specific depth interval (ie 471.3-473.2) and are found in 631/72-95 and 710/2-11. The <#35 mesh samples were also analyzed for XRF, LOI, ICP-MS, and XRD analyses.

Equipment: Coulter Surface Area Analyzer model SA 3100, serial number 46020
Mettler Electronic Balance model AE240, serial number 101237 BW 5-19-05

Reagents: NIST silicon nitride surface area standard 1899 ($10 m^2/g$)
Helium - Zero grade - 99.995%
Nitrogen - UHP grade - 99.999%
Liquid nitrogen
DOW Corning high vacuum grease
Type I water

Supplies: Loading funnel
3cc to 9cc glass surface area sample tubes with glass inserts and tube caps
Weighing paper
Spatulas

Procedure

Prior to using the surface area analyzer, the O-rings were checked for integrity and replaced with new ones if brittle or cracked. The o-rings were lubricated with high vacuum grease.

During the initial stages of analyses and at the conclusion, the surface area analyzer was challenged with a standard of known surface area ($10 m^2/g$) that was expected to have a surface area similar to the samples. The surface area analyzer can outgas three different samples at a time but can only perform the surface area determination one sample at a time.

The mass of the empty glass sample tube with glass stirrer and cap was recorded. An appropriate amount (between 1.7 to 2.0 g) of sample was added to a tared weigh paper and the mass recorded. The aliquot was transferred into a glass sample tube with a loading funnel on top. The loading funnel was removed and replaced with a tube cap. This process was repeated for two other samples since three samples can be outgassed at one time.

The following sample information was entered into the surface area analyzer data acquisition software prior to outgassing: sample ID, operator, and sample mass. The software limits to sample ID to six characters so another sample ID was created for each sample. This new ID

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was recorded (along with the original sample ID) when the initial aliquot mass was recorded. This new sample ID had a prefix "22-" on all of the samples to indicate that the samples came from the NC-EWDP-22PC well. The last three characters were unique numbers that represents the sample interval depth. A single number (depth) was selected within the original sample interval range that did not overlap with any other sample interval range.

The tube caps were removed and the samples were inserted into the surface area analyzer for outgassing under the following conditions: outgas temperature of 350°C and outgas time of 720 minutes. Once the outgas process was complete, the samples could be removed. Each sample tube was promptly recapped and the "total mass" after outgassing is recorded. The sample mass after the outgassing process, referred to as the "outgas sample mass", was calculated by subtracting the mass of the empty sample tube with glass stirrer and cap from the "total mass".

The surface area analyses proceeded one sample at a time. An outgassed sample was uncapped and reloaded into the analyzer. The sample mass information in the data acquisition software was updated with the "outgas sample mass". Liquid nitrogen was added to the analyzer and the analysis automatically starts. At the completion of the analyses a hardcopy of the results was generated and placed in the scientific notebook. The process was repeated for the remaining two outgassed samples.

After the analyses was complete, the sample aliquot was discarded. The sample glass tubes, inserts and caps were cleaned with type I water and oven dried. The whole process was repeated for another set of three samples.

*This is a revised initial entry. The original initial entry is 710/15-16

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*see initial entry: 710/18-19
*Sample prefix: NC-EWDP-22PC-0305 ①

Surface Area Analyses of NCEWDP22PC0305
<#35 Sonic Core Samples.

Initial, before outgassing - original

Sample ID ①	SAA ID# Sample	Mass (g) of tube, cap + insert (16 May 05 MR)	Aliquot mass (g)
555.3-556.8 <#35	22-555	29.3265	2.0481
640.3-641.4 <#35	22-640	29.42439	1.75701
694.3-695.6 <#35	22-695	29.8203	1.7227

Aliquot taken and discarded 1.8103

#SAA = Surface Area Analyses

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*see initial entry 710/18-19
*** calculation

Surface Area Analyses of NCEWDP22PC0305
< #35 Sonic Core Samples

*sample prefix: NCEWDP22PC0305 ①
After outgassing

Sample ID ①	SAA Sample# ID	Total Mass (g)	Outgass Sample mass (g) ***
555.3-556.8 <#35	22-555	31.1851	1.8586
640.3-641.4 <#35	22-640	31.0499	1.62551
694.3-695.6 <#35	22-695	31.4246	1.6043

#SAA = Surface Area Analyses

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SAA printout - SAA Sample ID 22-~~555~~ 555

SA256
Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-555	Start Date	02/15/04
Customer	CNWRA	Start Time	04:21:08
Operator	MR	Elapsed Time	54 min
Sample Wt	1.8586 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	21.153 sq.m/g
Micropore Surface Area	8.657 sq.m/g
Micropore Volume	0.00371 ml/g
Correlation Coefficient	0.99933

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-555	Start Date	02/15/04
Customer	CNWRA	Start Time	04:21:08
Operator	MR	Elapsed Time	54 min
Sample Wt	1.8586 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	21.153 sq.m/g
Total Surface Area	29.810 sq.m/g
Micropore Surface Area	8.657 sq.m/g
Micropore Volume	0.00371 ml/g
Film Thickness Range	0.35 to 0.50
Slope	13.6734
Intercept	2.39875
Correlation Coefficient	0.99933

Film Thickness (nm)	Vads (cc/g STP)
0.3523	7.181
0.3679	7.420
0.3802	7.602
0.3939	7.798
0.4082	8.000
0.4217	8.188
0.4358	8.378

Sample ID:
NCEWDP22PC 0305
555.3-556.8 <#35
Mass (g) before outgassing:
710/20
Mass (g) after outgassing
710/21
19 May 05 MR

Witness ____ Page No.____

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SAA printout cont. - SAA Sample ID 22-~~555~~ 555

SA256

0.4610	8.697
0.4872	9.028

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-555	Start Date	02/15/04
Customer	CNWRA	Start Time	04:21:08
Operator	MR	Elapsed Time	54 min
Sample Wt	1.8586 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0181
Intercept	0.0037
Correlation Coefficient	0.99999

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	734.36
0.0001	0.240	0.038	734.41
0.0001	0.479	0.074	734.41
0.0001	0.756	0.109	734.54
0.0003	1.064	0.206	734.59
0.0003	1.366	0.212	734.77
0.0004	1.752	0.321	734.77
0.0005	2.090	0.364	734.95
0.0008	2.567	0.566	735.02
0.0011	2.942	0.788	734.92
0.0015	3.337	1.130	735.06
0.0024	3.750	1.757	735.11
0.0036	4.183	2.631	735.20
0.0052	4.633	3.852	735.27
0.0078	5.096	5.768	735.28
0.0107	5.416	7.873	735.41
0.0149	5.713	10.993	735.46
0.0209	5.983	15.337	735.49
0.0251	6.133	18.451	735.48
0.0300	6.277	22.101	735.56
0.0357	6.417	26.263	735.60
0.0418	6.544	30.752	735.61
0.0480	6.665	35.321	735.59
0.0545	6.781	40.092	735.67
0.0588	6.857	43.247	735.67
0.0636	6.936	46.755	735.61
0.0708	7.044	52.070	735.75
0.0806	7.181	59.319	735.63
0.1001	7.420	73.622	735.59
0.1165	7.602	85.692	735.63
0.1356	7.798	99.709	735.56
0.1564	8.000	115.040	735.62
0.1768	8.188	130.034	735.55

Witnessed & Recorded by

Project No.
Book No. TITLE

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SAA printout - SAA Sample ID 22-~~655~~ 555

SA256

0.1983	8.378	145.886	735.55
0.2375	8.697	174.686	735.49
0.2784	9.028	204.778	735.50
0.3162	9.318	232.564	735.39
0.3598	9.659	264.611	735.42
0.3982	9.950	292.782	735.32
0.4415	10.279	324.625	735.22

17 May 05 MR

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Recorded by

Project No.
TITLE Book No.

From Page No. 17 May 05 MR - cont.
SAA printout - SAA Sample ID : 22-640

SA257

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-640	Start Date	02/15/04
Customer	CNWRA	Start Time	06:06:54
Operator	MR	Elapsed Time	52 min
Sample Wt	1.62551 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	17.020 sq.m/g
Micropore Surface Area	6.684 sq.m/g
Micropore Volume	0.00287 ml/g
Correlation Coefficient	0.99956

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-640	Start Date	02/15/04
Customer	CNWRA	Start Time	06:06:54
Operator	MR	Elapsed Time	52 min
Sample Wt	1.62551 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	17.020 sq.m/g
Total Surface Area	23.704 sq.m/g
Micropore Surface Area	6.684 sq.m/g
Micropore Volume	0.00287 ml/g
Film Thickness Range	0.35 to 0.50
Slope	11.0018
Intercept	1.85675
Correlation Coefficient	0.99956

19 May 05 MR

Sample ID:
NCEWDP22PC0305
640.3 – 641.4 < #35

Film Thickness (nm)	Vads (cc/g STP)
0.3522	5.710
0.3691	5.912
0.3800	6.038
0.3938	6.199
0.4084	6.363
0.4229	6.523
0.4357	6.661

Mass(g) before outgassing
710/20
Mass(g) after outgassing
710/21

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From Page No. 17 May 05 MR cont.

SAA printout - SAA Sample ID: 22-640

SA257

0.4607	6.925
0.4875	7.198

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-640	Start Date	02/15/04
Customer	CNWRA	Start Time	06:06:54
Operator	MR	Elapsed Time	52 min
Sample Wt	1.62551 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0170
Intercept	0.0029
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	748.11
0.0000	0.272	0.034	748.08
0.0001	0.544	0.066	747.97
0.0001	0.863	0.098	747.95
0.0003	1.217	0.202	747.86
0.0004	1.561	0.263	747.84
0.0007	2.000	0.543	747.91
0.0012	2.380	0.886	747.84
0.0020	2.774	1.502	747.81
0.0033	3.183	2.456	747.87
0.0052	3.606	3.863	747.84
0.0081	4.036	6.079	747.84
0.0124	4.378	9.306	747.99
0.0193	4.673	14.413	747.94
0.0281	4.919	21.016	748.00
0.0339	5.044	25.339	747.97
0.0403	5.165	30.181	748.09
0.0479	5.284	35.821	748.02
0.0551	5.395	41.236	748.02
0.0600	5.462	44.900	748.07
0.0655	5.535	48.985	748.11
0.0705	5.598	52.755	748.14
0.0806	5.710	60.316	748.10
0.1017	5.912	76.064	748.02
0.1161	6.038	86.872	748.04
0.1354	6.199	101.297	748.07
0.1567	6.363	117.200	748.00
0.1785	6.523	133.540	747.96
0.1982	6.661	148.204	747.91
0.2371	6.925	177.300	747.87
0.2789	7.198	208.575	747.87
0.3183	7.458	238.000	747.81
0.3583	7.722	267.938	747.73

Witnesse

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No.

From Page No. 17 May 05 MR cont.

SAA printout - SAA Sample ID: 22-640

SA257

0.3990	7.994	298.319	747.73
0.4406	8.279	329.439	747.73

17 May 05 MR

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From Page No. 17 May 05 MR cont.
SAA printout - SAA Sample ID: 22-695

SA258

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-695	Start Date	02/15/04
Customer	CNWRA	Start Time	07:23:55
Operator	MR	Elapsed Time	48 min
Sample Wt	1.6043 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	14.120 sq.m/g
Micropore Surface Area	5.333 sq.m/g
Micropore Volume	0.00229 ml/g
Correlation Coefficient	0.99956

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-695	Start Date	02/15/04
Customer	CNWRA	Start Time	07:23:55
Operator	MR	Elapsed Time	48 min
Sample Wt	1.6043 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	14.120 sq.m/g
Total Surface Area	19.453 sq.m/g
Micropore Surface Area	5.333 sq.m/g
Micropore Volume	0.00229 ml/g
Film Thickness Range	0.35 to 0.50
Slope	9.1275
Intercept	1.48217
Correlation Coefficient	0.99956

19 May 05 MR
- Sample ID: NLEWDP22PC0305 694.3-695.6 L#35

Film Thickness (nm)	Vads (cc/g STP)
0.3523	4.678
0.3687	4.843
0.3801	4.956
0.3949	5.095
0.4092	5.228
0.4223	5.347
0.4360	5.471

- Mass (g) before outgassing 710/20
- Mass (g) after outgassing 710/21

From Page No. 17 May 05 MR cont.
SAA printout - SAA Sample ID: 22-695

SA258

0.4613	5.691
0.4877	5.916

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-695	Start Date	02/15/04
Customer	CNWRA	Start Time	07:23:55
Operator	MR	Elapsed Time	48 min
Sample Wt	1.6043 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0164
Intercept	0.0026
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	748.07
0.0000	0.279	0.032	748.16
0.0001	0.555	0.062	748.17
0.0001	0.876	0.108	748.16
0.0003	1.235	0.254	748.24
0.0005	1.581	0.411	748.23
0.0011	1.941	0.789	748.24
0.0019	2.319	1.455	748.30
0.0034	2.708	2.562	748.29
0.0058	3.105	4.324	748.32
0.0101	3.493	7.543	748.37
0.0173	3.792	12.947	748.35
0.0275	4.027	20.545	748.42
0.0337	4.137	25.247	748.47
0.0408	4.242	30.538	748.48
0.0490	4.351	36.676	748.50
0.0572	4.447	42.805	748.44
0.0625	4.504	46.754	748.44
0.0698	4.579	52.243	748.44
0.0807	4.678	60.409	748.42
0.1011	4.843	75.661	748.39
0.1164	4.956	87.090	748.37
0.1371	5.095	102.598	748.32
0.1579	5.228	118.183	748.27
0.1776	5.347	132.874	748.27
0.1986	5.471	148.581	748.21
0.2380	5.691	178.049	748.17
0.2792	5.916	208.853	748.16
0.3180	6.127	237.858	748.07
0.3586	6.351	268.260	748.12
0.3992	6.569	298.590	748.02
0.4416	6.798	330.361	748.05

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*see initial entry: 710/18-19

*sample prefixes: NC-EWDP-22PC-0305 ①

Surface Area Analyses of NCEWDP-22PC-0305 <#35 Sonic Core Samples.

Initial, before outgassing / original

Sample ID ①	SAA Sample# ID	Mass(g) of tube, cap + insert	Aliquot Mass (g)
614.1-615.5, <#35	22-614	28.7584	1.8848
647.1-648.4, <#35	22-647	29.0327	1.7094
NIST-1899 Silicon nitride	17May05 MR ~~1899-S~~ 1899S	29.4326	17May05 MR ~~1.7349~~ 1.1455

~~*sample aliquot mass (g) is without weight of weighing paper ~ 0.2481~~ 18 May 05 MR

SAA = Surface Area Analyses.

18 May 05 MR

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From Page No. 18 May 05 MR

See initial entry 710/18-19

Sample ID prefix: NCEWDP-22PC-0305 ①

Surface Area Analysis of NCEWDP22PC0305 <#35 Sonic Core Samples after outgassing

After outgassing

Sample ID ①	SAA Sample# ID	Total Mass (g)	Outgassed Sample Mass (g)*
614.1-615.5 <#35	22-614	30.4984	1.7400
647.1-648.4 <#35	22-647	30.6302	1.5975
NIST-1899 Silicon Nitride	1899S	30.5790	1.1444

~~*Calculation = total mass - mass of tube, cap + insert, 710/30~~ ~~- total mass is the mass (g) of the tube, cap + insert plus the sample after outgassing.~~ 18 May 05 MR

SAA = Surface Area Analyses

18 May 05 MR

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SA259
Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-614	Start Date	02/17/04
Customer	CNWRA	Start Time	02:51:58
Operator	MR	Elapsed Time	47 min
Sample Wt	1.74 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	16.785 sq.m/g
Micropore Surface Area	7.259 sq.m/g
Micropore Volume	0.00313 ml/g
Correlation Coefficient	0.99933

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-614	Start Date	02/17/04
Customer	CNWRA	Start Time	02:51:58
Operator	MR	Elapsed Time	47 min
Sample Wt	1.74 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	16.785 sq.m/g
Total Surface Area	24.044 sq.m/g
Micropore Surface Area	7.259 sq.m/g
Micropore Volume	0.00313 ml/g
Film Thickness Range	0.35 to 0.50
Slope	10.8500
Intercept	2.02302
Correlation Coefficient	0.99933

Film Thickness (nm)	Vads (cc/g STP)
0.3522	5.816
0.3682	6.011
0.3795	6.146
0.3946	6.317
0.4087	6.476
0.4219	6.617
0.4360	6.765

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-Sample ID:
NE-EWDP-22PC-0305
614.1-615.5 L#35
-Surface Area Analyses ID:
22-614
-Mass before outgassing
710/30
-Mass (g) after outgassing
710/31
19 May 05 MR

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Recorded by

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0.4603	7.016
0.4865	7.276

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-614	Start Date	02/17/04
Customer	CNWRA	Start Time	02:51:58
Operator	MR	Elapsed Time	47 min
Sample Wt	1.74 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0170
Intercept	0.0027
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	744.13
0.0000	0.254	0.035	744.05
0.0001	0.511	0.063	744.19
0.0001	0.807	0.102	744.12
0.0003	1.137	0.215	744.16
0.0003	1.458	0.258	744.18
0.0006	1.869	0.446	744.25
0.0009	2.228	0.639	744.27
0.0014	2.601	1.039	744.37
0.0022	2.995	1.667	744.40
0.0036	3.402	2.664	744.31
0.0055	3.824	4.119	744.43
0.0088	4.250	6.552	744.44
0.0134	4.569	10.008	744.42
0.0204	4.843	15.195	744.48
0.0256	4.986	19.028	744.43
0.0314	5.122	23.339	744.44
0.0382	5.250	28.416	744.47
0.0452	5.367	33.662	744.67
0.0525	5.473	39.111	744.56
0.0574	5.541	42.727	744.59
0.0628	5.613	46.774	744.60
0.0702	5.703	52.272	744.65
0.0806	5.816	60.036	744.71
0.1005	6.011	74.829	744.76
0.1155	6.146	86.036	744.64
0.1366	6.317	101.708	744.70
0.1573	6.476	117.116	744.68
0.1771	6.617	131.856	744.71
0.1986	6.765	147.920	744.72
0.2364	7.016	176.080	744.69
0.2773	7.276	206.484	744.68
0.3188	7.538	237.393	744.69
0.3580	7.787	266.549	744.65
0.3991	8.046	297.211	744.63
0.4410	8.312	328.373	744.59

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Recorded by

From Page No.____ 19 May 05 MR cont.
SampleID: NCEWDP22PG-0305 647.1-648.4 <#35
Surface Area Analyses ID: 22-647

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-647	Start Date	02/17/04
Customer	CNWRA	Start Time	06:15:38
Operator	MR	Elapsed Time	56 min
Sample Wt	1.5975 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	13.596 sq.m/g
Micropore Surface Area	6.030 sq.m/g
Micropore Volume	0.00260 ml/g
Correlation Coefficient	0.99921

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-647	Start Date	02/17/04
Customer	CNWRA	Start Time	06:15:38
Operator	MR	Elapsed Time	56 min
Sample Wt	1.5975 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	13.596 sq.m/g
Total Surface Area	19.626 sq.m/g
Micropore Surface Area	6.030 sq.m/g
Micropore Volume	0.00260 ml/g
Film Thickness Range	0.35 to 0.50
Slope	8.7888
Intercept	1.67931
Correlation Coefficient	0.99921

Film Thickness (nm)	Vads (cc/g STP)
0.3517	4.746
0.3686	4.912
0.3832	5.050
0.3944	5.159
0.4089	5.286
0.4238	5.419
0.4356	5.519

- Mass (g) before outgassing 710/30
- Mass (g) after outgassing 710/31
19 May 05 MR

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0.4611	5.731
0.4878	5.943

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-647	Start Date	02/17/04
Customer	CNWRA	Start Time	06:15:38
Operator	MR	Elapsed Time	56 min
Sample Wt	1.5975 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0184
Intercept	0.0051
Correlation Coefficient	0.99999

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	746.24
0.0001	0.276	0.042	746.25
0.0001	0.555	0.081	746.22
0.0002	0.877	0.122	746.26
0.0004	1.234	0.280	746.23
0.0006	1.580	0.440	746.30
0.0011	1.939	0.838	746.29
0.0020	2.316	1.504	746.25
0.0035	2.701	2.628	746.33
0.0059	3.096	4.386	746.28
0.0099	3.481	7.398	746.21
0.0164	3.786	12.212	746.25
0.0254	4.033	18.943	746.27
0.0313	4.153	23.390	746.19
0.0381	4.263	28.437	746.17
0.0457	4.374	34.114	746.15
0.0536	4.473	39.956	746.12
0.0585	4.535	43.668	746.10
0.0645	4.599	48.111	746.14
0.0708	4.663	52.854	746.13
0.0800	4.746	59.655	746.13
0.1010	4.912	75.364	746.11
0.1206	5.050	89.954	746.12
0.1363	5.159	101.718	746.07
0.1574	5.286	117.465	746.09
0.1799	5.419	134.229	746.04
0.1980	5.519	147.674	746.02
0.2377	5.731	177.300	745.96
0.2794	5.943	208.383	745.94
0.3184	6.144	237.477	745.89
0.3584	6.350	267.328	745.91
0.3989	6.564	297.512	745.86
0.4403	6.780	328.356	745.79

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Witnessed & Understood by me, | Date | Invented by | Date | Recorded by

From Page No.___ 19 May 05 MR cont.

Sample ID: NIST 1899 silicon nitride standard
Surface Area Analyses ID: 1899S

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	1899S	Start Date	02/17/04
Customer	CNWRA	Start Time	07:50:42
Operator	MR	Elapsed Time	33 min
Sample Wt	1.1444 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	10.193 sq.m/g
Micropore Surface Area	0.242 sq.m/g
Micropore Volume	0.00017 ml/g
Correlation Coefficient	0.99991

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	1899S	Start Date	02/17/04
Customer	CNWRA	Start Time	07:50:42
Operator	MR	Elapsed Time	33 min
Sample Wt	1.1444 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	10.193 sq.m/g
Total Surface Area	10.435 sq.m/g
Micropore Surface Area	0.642 sq.m/g
Micropore Volume	0.00017 ml/g
Film Thickness Range	0.35 to 0.50
Slope	6.5886
Intercept	0.10673
Correlation Coefficient	0.99991

Film Thickness (nm)	Vads (cc/g STP)
0.3518	2.418
0.3680	2.530
0.3818	2.624
0.3959	2.718
0.4098	2.811
0.4232	2.899
0.4364	2.984

- Mass(g) before outgassing: 710/30
- Mass(g) after outgassing 710/31

19 May 05 MR

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0.4619	3.148
0.4879	3.316

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	1899S	Start Date	02/17/04
Customer	CNWRA	Start Time	07:50:42
Operator	MR	Elapsed Time	33 min
Sample Wt	1.1444 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0191
Intercept	0.0056
Correlation Coefficient	0.99999

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	746.96
0.0001	0.385	0.049	746.99
0.0003	0.773	0.247	747.00
0.0017	1.193	1.266	746.97
0.0062	1.554	4.610	747.03
0.0185	1.871	13.801	747.01
0.0330	2.061	24.634	747.00
0.0397	2.127	29.674	747.03
0.0482	2.201	36.009	747.05
0.0587	2.280	43.830	747.03
0.0645	2.320	48.178	747.05
0.0718	2.368	53.618	747.04
0.0801	2.418	59.853	747.03
0.1003	2.530	74.910	747.00
0.1186	2.624	88.620	747.03
0.1384	2.718	103.418	747.00
0.1588	2.811	118.657	746.99
0.1790	2.899	133.719	746.99
0.1992	2.984	148.805	746.94
0.2389	3.148	178.431	746.93
0.2795	3.316	208.755	746.93
0.3188	3.479	238.086	746.88
0.3596	3.650	268.561	746.88
0.3994	3.823	298.324	746.86
0.4397	3.998	328.397	746.81

19 May 05 MR

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From Page No. 19 May 05 MR cont.

see initial entry: 710/18-19

sample prefixes: NCEWDP22PC0305 ①

Surface ~~Aa~~ 19 May 05 Area Analyses of NCEWDP22PC-0305 <#35 Sonic Core Samples.

Initial, before outgassing

Sample ID ①	Surface Area Analyses Sample ID	Mass(g) of tube, cap + insert	Aliquot ~~of~~ 19 May 05 MR Mass(g)
747.4-748.8 <#35	22-748	29.5351	1.8451
710.6-712.1 <#35	22-711	29.8117	1.8989

For every sample from 19 May 2005 and forward, the sample containers of NCEWDP22PC-0305-"interval"-<#35 will be gently rolled prior to aliquot removal to avoid a bias due to grain size settling within the container.

19 May 05 MR

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From Page No. 20 May 05 MR

See initial entry: 710/18-19

Sample prefixes: NCEWDP22PC0305 ①

Surface Area Analyses of NCEWDP22PC0305 <#35 Sonic Core Samples. after outgassing

After outgassing

Sample ID ①	Surface Area Analyses Sample ID	Total Mass(g)	Outgass Sample Mass(g) *
747.4-748.8 <#35	22-748	31.1945	1.6594
710.6-712.1 <#35	22-711	31.6041	1.7924

*calculation

20 May 05 MR

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From Page No. 20 May 05 MR cont.

Sample ID: NCEWDP22PC-0305 710.6-712.1 < #35
surface area analyses: 22-711
mass(g) before outgassing: 710/38
mass(g) after outgassing: 710/39

Serial No.	w46020	Software Version	2.13
Sample ID	22-711	Start Date	02/19/04
Customer	CNWRA	Start Time	03:50:30
Operator	MR	Elapsed Time	37 min
Sample Wt	1.7924 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	7.611 sq.m/g
Micropore Surface Area	2.600 sq.m/g
Micropore Volume	0.00111 ml/g
Correlation Coefficient	0.99973

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-711	Start Date	02/19/04
Customer	CNWRA	Start Time	03:50:30
Operator	MR	Elapsed Time	37 min
Sample Wt	1.7924 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	7.611 sq.m/g
Total Surface Area	10.211 sq.m/g
Micropore Surface Area	2.600 sq.m/g
Micropore Volume	0.00111 ml/g
Film Thickness Range	0.35 to 0.50
Slope	4.9197
Intercept	0.71887
Correlation Coefficient	0.99973

Film Thickness (nm)	Vads (cc/g STP)
0.3529	2.447
0.3680	2.527
0.3808	2.594
0.3953	2.667
0.4095	2.738
0.4227	2.803
0.4362	2.869

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From Page No. 20 May 05 MR cont.

0.4618	2.989
0.4879	3.112

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-711	Start Date	02/19/04
Customer	CNWRA	Start Time	03:50:30
Operator	MR	Elapsed Time	37 min
Sample Wt	1.7924 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0161
Intercept	0.0032
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	748.86
0.0000	0.246	0.032	748.91
0.0001	0.497	0.082	748.88
0.0004	0.785	0.290	748.96
0.0014	1.095	1.046	748.90
0.0033	1.378	2.442	748.91
0.0066	1.655	4.916	748.97
0.0146	1.926	10.926	749.02
0.0279	2.106	20.926	748.97
0.0354	2.172	26.489	749.06
0.0436	2.236	32.643	749.05
0.0539	2.300	40.362	749.07
0.0597	2.337	44.730	749.10
0.0693	2.389	51.899	749.10
0.0814	2.447	60.961	749.06
0.1002	2.527	75.088	749.09
0.1173	2.594	87.865	749.17
0.1376	2.667	103.070	749.11
0.1585	2.738	118.707	749.15
0.1782	2.803	133.485	749.10
0.1990	2.869	149.057	749.11
0.2388	2.989	178.859	749.05
0.2795	3.112	209.326	749.03
0.3181	3.231	238.285	749.01
0.3592	3.358	269.010	748.97
0.3995	3.488	299.199	748.94
0.4401	3.621	329.583	748.91

20 May 05 MR

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From Page No.___ 26 May 05 MR cont.

Sample ID: NC-EWDP-22PC-0305 747.4-748.8 <#35
Surface area analyses: 22-748
mass (g) before outgassing: 710/38
mass (g) after outgassing 710/39

Serial No.	w46020	Software Version	2.13
Sample ID	22-748	Start Date	02/19/04
Customer	CNWRA	Start Time	02:39:32
Operator	MR	Elapsed Time	45 min
Sample Wt	1.6594 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	11.891 sq.m/g
Micropore Surface Area	4.950 sq.m/g
Micropore Volume	0.00215 ml/g
Correlation Coefficient	0.99960

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-748	Start Date	02/19/04
Customer	CNWRA	Start Time	02:39:32
Operator	MR	Elapsed Time	45 min
Sample Wt	1.6594 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	11.891 sq.m/g
Total Surface Area	16.841 sq.m/g
Micropore Surface Area	4.950 sq.m/g
Micropore Volume	0.00215 ml/g
Film Thickness Range	0.35 to 0.50
Slope	7.6864
Intercept	1.38795
Correlation Coefficient	0.99960

Film Thickness (nm)	Vads (cc/g STP)
0.3522	4.081
0.3686	4.215
0.3804	4.315
0.3939	4.423
0.4094	4.544
0.4227	4.647
0.4359	4.746

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0.4611	4.931
0.4872	5.118

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-748	Start Date	02/19/04
Customer	CNWRA	Start Time	02:39:32
Operator	MR	Elapsed Time	45 min
Sample Wt	1.6594 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0168
Intercept	0.0025
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	747.99
0.0000	0.267	0.029	748.02
0.0001	0.537	0.071	748.02
0.0002	0.846	0.165	748.05
0.0004	1.161	0.262	748.08
0.0008	1.541	0.580	748.10
0.0015	1.888	1.116	748.13
0.0028	2.243	2.081	748.16
0.0049	2.604	3.676	748.19
0.0086	2.962	6.463	748.19
0.0155	3.258	11.588	748.22
0.0257	3.489	19.193	748.22
0.0321	3.595	24.036	748.28
0.0395	3.691	29.578	748.30
0.0478	3.790	35.795	748.25
0.0564	3.876	42.238	748.28
0.0617	3.927	46.182	748.29
0.0697	3.996	52.147	748.28
0.0806	4.081	60.282	748.29
0.1010	4.215	75.560	748.29
0.1168	4.315	87.383	748.30
0.1357	4.423	101.521	748.29
0.1582	4.544	118.405	748.28
0.1783	4.647	133.428	748.27
0.1985	4.746	148.558	748.26
0.2378	4.931	177.890	748.22
0.2784	5.118	208.275	748.24
0.3186	5.303	238.423	748.25
0.3587	5.490	268.358	748.23
0.3989	5.675	298.451	748.22
0.4408	5.874	329.830	748.23

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From Page No. 20 May 05 MR cont.
See initial entry: 710/18-19
sample prefixes: NCEWDP22PC 0305 ①

Surface Area Analyses of NCEWDP 22PC-0305
<#35 Sonic Core Samples Prior to Outgassing

Initial, before outgassing

Sample ID ①	Surface Area Analyses Sample ID	Mass(g) of tube, cap + insert	Aliquot Mass(g)
618.5-620.5 <#35	22-619	29.4939	1.7715
740.5-742.0 <#35	22-741	29.0830	1.9858
760.3-761.6 <#35	22-760	28.6473	1.86663

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From Page No. 23 May 05 MR
see initial entry: 710/18-19
sample prefixes: NCEWDP-22PC-0305 ①

Surface Area Analyses of NCEWDP22PC-0305
<#35 Sonic Core Samples After Outgassing

After outgassing

Sample ID ①	Surface Area Analyses Sample ID	Total Mass(g)	Outgass Sample Mass(g)*
618.5-620.5 <#35	22-619	31.1672	1.6733
740.5-742.0 <#35	22-741	30.9143	1.8313
760.3-761.6 <#35	22-760	30.4329	1.7856

* calculation

24 May 05 MR

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From Page No.____ 24 May 05 MR
sample ID: NCEWDP22PC0305 618.5-620.5 <#35
surface area analyses ID: 22-619
mass (g) before outgassing: 710/44
mass (g) after outgassing: 710/45

Serial No.	w46020	Software Version	2.13
Sample ID	22-619	Start Date	02/22/04
Customer	CNWRA	Start Time	03:49:29
Operator	MR	Elapsed Time	42 min
Sample Wt	1.6733 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	14.625 sq.m/g
Micropore Surface Area	5.743 sq.m/g
Micropore Volume	0.00247 ml/g
Correlation Coefficient	0.99964

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-619	Start Date	02/22/04
Customer	CNWRA	Start Time	03:49:29
Operator	MR	Elapsed Time	42 min
Sample Wt	1.6733 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	14.625 sq.m/g
Total Surface Area	20.368 sq.m/g
Micropore Surface Area	5.743 sq.m/g
Micropore Volume	0.00247 ml/g
Film Thickness Range	0.35 to 0.50
Slope	9.4537
Intercept	1.59809
Correlation Coefficient	0.99964

Film Thickness (nm)	Vads (cc/g STP)
0.3529	4.916
0.3678	5.071
0.3804	5.195
0.3949	5.339
0.4083	5.469
0.4228	5.605
0.4361	5.729

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0.4606	5.952
0.4875	6.190

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-619	Start Date	02/22/04
Customer	CNWRA	Start Time	03:49:29
Operator	MR	Elapsed Time	42 min
Sample Wt	1.6733 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0178
Intercept	0.0028
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	741.09
0.0000	0.264	0.027	741.09
0.0001	0.532	0.057	741.14
0.0001	0.843	0.092	741.26
0.0003	1.186	0.215	741.33
0.0005	1.517	0.344	741.42
0.0010	1.941	0.714	741.51
0.0017	2.303	1.232	741.54
0.0028	2.677	2.108	741.62
0.0046	3.068	3.431	741.70
0.0074	3.462	5.513	741.82
0.0119	3.791	8.859	741.89
0.0195	4.066	14.457	741.92
0.0295	4.286	21.854	742.04
0.0357	4.391	26.495	742.06
0.0426	4.491	31.597	742.09
0.0505	4.594	37.504	742.15
0.0558	4.655	41.401	742.19
0.0613	4.720	45.491	742.18
0.0698	4.808	51.816	742.18
0.0814	4.916	60.402	742.21
0.0999	5.071	74.169	742.22
0.1167	5.195	86.612	742.23
0.1370	5.339	101.717	742.23
0.1566	5.469	116.203	742.27
0.1784	5.605	132.388	742.26
0.1988	5.729	147.526	742.26
0.2369	5.952	175.833	742.28
0.2789	6.190	207.011	742.26
0.3186	6.418	236.507	742.26
0.3580	6.644	265.719	742.23
0.3994	6.883	296.443	742.22
0.4409	7.121	327.212	742.17

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Witnessed & Understood by me, | Date | Invented by | Date
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From Page No. 24 May 05 MR cont.

Sample ID: NCEWDP22PC0305 740.5-742.0 <#35
Surface area analyses ID: 22-741
mass(g) before outgassing: 710/44
mass(g) after outgassing: 710/45

Serial No.	w46020	Software Version	2.13
Sample ID	22-741	Start Date	02/22/04
Customer	CNWRA	Start Time	05:15:50
Operator	MR	Elapsed Time	46 min
Sample Wt	1.8313 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	16.150 sq.m/g
Micropore Surface Area	6.261 sq.m/g
Micropore Volume	0.00270 ml/g
Correlation Coefficient	0.99971

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-741	Start Date	02/22/04
Customer	CNWRA	Start Time	05:15:50
Operator	MR	Elapsed Time	46 min
Sample Wt	1.8313 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	16.150 sq.m/g
Total Surface Area	22.410 sq.m/g
Micropore Surface Area	6.261 sq.m/g
Micropore Volume	0.00270 ml/g
Film Thickness Range	0.35 to 0.50
Slope	10.4394
Intercept	1.74422
Correlation Coefficient	0.99971

Film Thickness (nm)	Vads (cc/g STP)
0.3518	5.399
0.3691	5.594
0.3805	5.720
0.3941	5.864
0.4087	6.021
0.4217	6.157
0.4362	6.308

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0.4611	6.556
0.4875	6.816

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.1
Sample ID	22-741	Start Date	02/22/0
Customer	CNWRA	Start Time	05:15:5
Operator	MR	Elapsed Time	46 mi
Sample Wt	1.8313 g	Outgas Time	720 mi
Profile	BET5-T	Outgas Temperature	350

Isotherm Data

Freespace Calculation

Slope	0.0178
Intercept	0.0025
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	745.98
0.0000	0.244	0.029	746.05
0.0001	0.487	0.059	746.03
0.0001	0.770	0.088	746.02
0.0002	1.082	0.172	746.07
0.0003	1.433	0.236	746.05
0.0006	1.823	0.438	746.05
0.0009	2.163	0.669	746.02
0.0015	2.518	1.137	746.07
0.0025	2.888	1.850	746.11
0.0039	3.271	2.946	746.08
0.0061	3.668	4.586	746.09
0.0092	3.993	6.839	746.12
0.0142	4.285	10.621	746.13
0.0218	4.533	16.249	746.15
0.0270	4.662	20.156	746.13
0.0329	4.781	24.566	746.15
0.0398	4.895	29.663	746.13
0.0467	5.002	34.874	746.09
0.0540	5.100	40.283	746.12
0.0589	5.163	43.939	746.12
0.0643	5.228	47.955	746.12
0.0701	5.294	52.297	746.11
0.0802	5.399	59.803	746.09
0.1017	5.594	75.841	746.07
0.1169	5.720	87.209	746.06
0.1359	5.864	101.357	746.05
0.1572	6.021	117.309	746.07
0.1768	6.157	131.868	746.04
0.1990	6.308	148.431	746.04
0.2377	6.556	177.300	746.02
0.2788	6.816	208.012	746.03
0.3174	7.062	236.785	745.98
0.3585	7.323	267.447	745.95
0.3999	7.581	298.297	745.98
0.4407	7.844	328.773	745.99

Witnessed & Understood by me, Date Invented by Date Recorded by

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sample ID: NCEWDP22PC0305 760.3-761.6 <#35

Surface area analyser: 22-760

mass before outgassing: 710/44

mass after outgassing: 710/45

Serial No.	w46020	Software Version	2.13
Sample ID	22-760	Start Date	02/22/04
Customer	CNWRA	Start Time	06:22:18
Operator	MR	Elapsed Time	42 min
Sample Wt	1.7856 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	9.133 sq.m/g
Micropore Surface Area	2.953 sq.m/g
Micropore Volume	0.00126 ml/g
Correlation Coefficient	0.99981

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-760	Start Date	02/22/04
Customer	CNWRA	Start Time	06:22:18
Operator	MR	Elapsed Time	42 min
Sample Wt	1.7856 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	9.133 sq.m/g
Total Surface Area	12.086 sq.m/g
Micropore Surface Area	2.953 sq.m/g
Micropore Volume	0.00126 ml/g
Film Thickness Range	0.35 to 0.50
Slope	5.9039
Intercept	0.81596
Correlation Coefficient	0.99981

Film Thickness (nm)	Vads (cc/g STP)
0.3520	2.885
0.3686	2.991
0.3806	3.064
0.3950	3.153
0.4089	3.235
0.4233	3.319
0.4360	3.394

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0.4613	3.537
0.4878	3.689

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-760	Start Date	02/22/04
Customer	CNWRA	Start Time	06:22:18
Operator	MR	Elapsed Time	42 min
Sample Wt	1.7856 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0172
Intercept	0.0029
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	747.12
0.0001	0.247	0.038	747.13
0.0001	0.496	0.078	747.13
0.0003	0.785	0.187	747.15
0.0008	1.099	0.605	747.18
0.0019	1.395	1.383	747.14
0.0038	1.694	2.871	747.14
0.0072	1.989	5.411	747.13
0.0145	2.259	10.805	747.14
0.0260	2.453	19.421	747.13
0.0330	2.535	24.654	747.15
0.0407	2.609	30.409	747.14
0.0499	2.683	37.312	747.15
0.0589	2.749	44.001	747.14
0.0644	2.788	48.125	747.15
0.0710	2.832	53.073	747.18
0.0803	2.885	59.983	747.13
0.1010	2.991	75.495	747.13
0.1171	3.064	87.458	747.16
0.1372	3.153	102.520	747.09
0.1575	3.235	117.700	747.09
0.1791	3.319	133.838	747.08
0.1986	3.394	148.344	747.03
0.2379	3.537	177.746	747.03
0.2793	3.689	208.615	747.03
0.3183	3.831	237.735	746.97
0.3592	3.987	268.338	746.96
0.3987	4.140	297.833	746.94
0.4409	4.303	329.291	746.87

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From Page No. 24 May 05 cont. MR

see initial entry: 710/18-19

sample ID prefixes: NCEWDP22PC0305 (1)

Surface Area Analyses of NCEWDP22PC0305 <#35 Sonic Core Samples Prior to Outgassing

Initial, before outgassing

Sample ID (1)	Surface Area Analyses Sample ID	Mass(g) of tube, cap + insert	Aliquot Mass(g)
476.9-478.5 <#35	22-~~476~~ 477 (25 May 05 MR)	29.7787	1.7018
522.1-523.5 <#35	22-522	29.5287	1.8681
686.1-687.4 <#35	22-686	29.5451	1.8304

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From Page No. 25 May 05 MR

see initial entry: 710/18-19

Sample ID prefixes: NCEWDP22PC0305 (1)

Surface Area Analyses of NCEWDP22PC0305 <#35 Sonic Core Samples After Outgassing

After outgassing

Sample ID (1)	Surface Area Analyses Sample ID	Total Mass(g)	Outgassed Sample Mass*
476.9-478.5 <#35	22-~~476~~ 477 (25 May 05 MR)	31.3723	1.5936
522.1-523.5 <#35	22-522	31.2069	1.6782
686.1-687.4 <#35	22-686	31.2799	1.7348

*calculation

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Sample ID: NCE WDP 22PC 0305 ~~476.9-4~~ 26 May 05 MR 476.9-478.5 #35
Surface area analysis ID: 22-477
Mass (g) before outgassing: 710/52
Mass (g) after outgassing: 710/53

Serial No.	w46020	Software Version	2.13
Sample ID	~~22-476~~ 22-477	Start Date	02/24/04
Customer	CNWRA 26 May 05 MR	Start Time	02:56:16
Operator	MR	Elapsed Time	48 min
Sample Wt	1.5936 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	15.929 sq.m/g
Micropore Surface Area	6.788 sq.m/g
Micropore Volume	0.00293 ml/g
Correlation Coefficient	0.99933

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	~~22-476~~ 22-477 26 May 05 MR	Start Date	02/24/04
Customer	CNWRA	Start Time	02:56:16
Operator	MR	Elapsed Time	48 min
Sample Wt	1.5936 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	15.929 sq.m/g
Total Surface Area	22.717 sq.m/g
Micropore Surface Area	6.788 sq.m/g
Micropore Volume	0.00293 ml/g
Film Thickness Range	0.35 to 0.50
Slope	10.2966
Intercept	1.89487
Correlation Coefficient	0.99933

Film Thickness (nm)	Vads (cc/g STP)
0.3527	5.502
0.3682	5.679
0.3796	5.804
0.3942	5.966
0.4081	6.113
0.4230	6.267
0.4357	6.396
0.4607	6.636
0.4879	6.893

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Serial No.	w46020	Software Version	2.13
Sample ID	~~22-476~~ 22-477 26 May 05 MR	Start Date	02/24/04
Customer	CNWRA	Start Time	02:56:16
Operator	MR	Elapsed Time	48 min
Sample Wt	1.5936 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0165
Intercept	0.0030
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	744.66
0.0000	0.281	0.033	744.64
0.0001	0.560	0.073	744.69
0.0002	0.882	0.162	744.70
0.0003	1.216	0.187	744.68
0.0005	1.618	0.342	744.80
0.0007	1.987	0.531	744.77
0.0013	2.370	0.940	744.77
0.0022	2.770	1.605	744.83
0.0036	3.187	2.706	744.81
0.0058	3.614	4.325	744.85
0.0089	3.989	6.625	744.87
0.0142	4.326	10.611	744.83
0.0222	4.608	16.562	744.89
0.0278	4.751	20.742	744.87
0.0344	4.883	25.598	744.91
0.0417	5.009	31.041	744.92
0.0495	5.123	36.892	744.91
0.0573	5.229	42.679	744.94
0.0622	5.294	46.329	744.98
0.0700	5.386	52.181	745.01
0.0812	5.502	60.510	745.03
0.1004	5.679	74.838	745.06
0.1156	5.804	86.117	745.05
0.1361	5.966	101.396	745.05
0.1564	6.113	116.518	745.09
0.1787	6.267	133.165	745.07
0.1981	6.396	147.620	745.04
0.2371	6.636	176.631	745.08
0.2794	6.893	208.168	745.03
0.3172	7.114	236.346	745.03
0.3586	7.366	267.184	745.02
0.3977	7.603	296.264	744.97
0.4422	7.867	329.438	744.99

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Sample ID: NCE WDP22PC0305 522.1-523.5 <#35
Surface area analyses ID: 22-522
Mass (g) before outgassing: 710/52
~~mass~~ 26May05 MR mass(g) after outgassing: 710/53

Serial No.	w46020	Software Version	2.13
Sample ID	22-522	Start Date	02/24/04
Customer	CNWRA	Start Time	05:29:04
Operator	MR	Elapsed Time	52 min
Sample Wt	1.6782 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	21.061 sq.m/g
Micropore Surface Area	8.553 sq.m/g
Micropore Volume	0.00366 ml/g
Correlation Coefficient	0.99924

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-522	Start Date	02/24/04
Customer	CNWRA	Start Time	05:29:04
Operator	MR	Elapsed Time	52 min
Sample Wt	1.6782 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	21.061 sq.m/g
Total Surface Area	29.614 sq.m/g
Micropore Surface Area	8.553 sq.m/g
Micropore Volume	0.00366 ml/g
Film Thickness Range	0.35 to 0.50
Slope	13.6139
Intercept	2.36639
Correlation Coefficient	0.99924

Film Thickness (nm)	Vads (cc/g STP)
0.3517	7.117
0.3692	7.384
0.3798	7.543
0.3942	7.747
0.4088	7.952
0.4215	8.129
0.4359	8.319
0.4617	8.649
0.4866	8.956

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Serial No.	w46020	Software Version	2.13
Sample ID	22-522	Start Date	02/24/04
Customer	CNWRA	Start Time	05:29:04
Operator	MR	Elapsed Time	52 min
Sample Wt	1.6782 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0169
Intercept	0.0024
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	745.20
0.0000	0.266	0.029	745.25
0.0001	0.531	0.053	745.24
0.0001	0.841	0.079	745.28
0.0002	1.182	0.172	745.30
0.0003	1.515	0.190	745.33
0.0004	1.939	0.307	745.37
0.0005	2.312	0.407	745.34
0.0010	2.838	0.745	745.42
0.0015	3.248	1.125	745.43
0.0024	3.678	1.794	745.44
0.0037	4.126	2.736	745.48
0.0055	4.593	4.070	745.50
0.0082	5.073	6.108	745.53
0.0114	5.422	8.534	745.58
0.0166	5.742	12.400	745.60
0.0236	6.023	17.580	745.57
0.0284	6.174	21.195	745.60
0.0340	6.319	25.369	745.62
0.0404	6.461	30.111	745.60
0.0469	6.591	34.959	745.60
0.0537	6.715	40.027	745.61
0.0583	6.795	43.448	745.60
0.0635	6.878	47.311	745.63
0.0703	6.983	52.409	745.62
0.0800	7.117	59.676	745.61
0.1018	7.384	75.882	745.59
0.1159	7.543	86.418	745.57
0.1360	7.747	101.423	745.55
0.1573	7.952	117.260	745.52
0.1764	8.129	131.482	745.46
0.1985	8.319	147.964	745.42
0.2386	8.649	177.873	745.38
0.2774	8.956	206.750	745.34
0.3175	9.264	236.651	745.29
0.3586	9.585	267.218	745.23
0.3981	9.886	296.642	745.20
0.4415	10.225	328.988	745.16

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Sample ID: NCEWDP22PC 0305 6686.1-6687.4 <#35
Surface area analyses ID: 22-6686
Mass(g) before outgassing: 710152
Mass(g) after outgassing: 710153

Serial No.	w46020	Software Version	2.13
Sample ID	22-686	Start Date	02/24/04
Customer	CNWRA	Start Time	06:42:15
Operator	MR	Elapsed Time	53 min
Sample Wt	1.7348 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	15.086 sq.m/g
Micropore Surface Area	6.171 sq.m/g
Micropore Volume	0.00265 ml/g
Correlation Coefficient	0.99946

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-686	Start Date	02/24/04
Customer	CNWRA	Start Time	06:42:15
Operator	MR	Elapsed Time	53 min
Sample Wt	1.7348 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

t-Plot Surface Area Report

t-Plot Surface Area	15.086 sq.m/g
Total Surface Area	21.257 sq.m/g
Micropore Surface Area	6.171 sq.m/g
Micropore Volume	0.00265 ml/g
Film Thickness Range	0.35 to 0.50
Slope	9.7515
Intercept	1.71591
Correlation Coefficient	0.99946

Film Thickness (nm)	Vads (cc/g STP)
0.3519	5.123
0.3701	5.321
0.3799	5.425
0.3943	5.571
0.4092	5.719
0.4221	5.844
0.4357	5.976
0.4609	6.210
0.4878	6.452

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Serial No.	w46020	Software Version	2.13
Sample ID	22-686	Start Date	02/24/04
Customer	CNWRA	Start Time	06:42:15
Operator	MR	Elapsed Time	53 min
Sample Wt	1.7348 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	350 C

Isotherm Data

Freespace Calculation

Slope	0.0179
Intercept	0.0056
Correlation Coefficient	0.99999

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	745.26
0.0001	0.254	0.047	745.28
0.0001	0.510	0.091	745.30
0.0002	0.807	0.155	745.30
0.0004	1.136	0.332	745.31
0.0006	1.457	0.426	745.34
0.0008	1.791	0.633	745.34
0.0012	2.145	0.885	745.33
0.0020	2.513	1.468	745.33
0.0033	2.897	2.433	745.33
0.0052	3.295	3.877	745.32
0.0085	3.691	6.323	745.34
0.0134	4.004	10.006	745.33
0.0210	4.266	15.673	745.31
0.0266	4.400	19.828	745.30
0.0329	4.523	24.497	745.29
0.0400	4.641	29.796	745.27
0.0473	4.747	35.256	745.24
0.0549	4.846	40.899	745.22
0.0600	4.908	44.686	745.19
0.0656	4.973	48.900	745.16
0.0706	5.030	52.639	745.14
0.0802	5.123	59.725	745.11
0.1030	5.321	76.753	745.07
0.1160	5.425	86.431	745.05
0.1362	5.571	101.472	745.02
0.1579	5.719	117.646	744.99
0.1773	5.844	132.091	744.96
0.1981	5.976	147.602	744.92
0.2374	6.210	176.847	744.88
0.2793	6.452	208.053	744.85
0.3179	6.674	236.742	744.80
0.3585	6.906	267.021	744.75
0.3993	7.139	297.332	744.72
0.4409	7.374	328.314	744.68

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Based on the initial instrument check (710/36-37) a more comprehensive approach to determining instrument performance and optimizing the instrument method was used. As a result some changes from the initial entry (710/18-19) will happen.

- increased frequency of challenges
- add ~~at~~ 26 May 05 MR additional standards with different values

For the set of 3 standards the following method parameters were changed.

outgass temp = from 350°C to 200°C
outgass time = from 720 mins to 180 mins.

Reagents:

NIST silicon nitride surface area standard 1899 (10 m²/g)

NIST alpha alumina surface area standard 8005 (2.09 m²/g)

Montmorillonite 061/94 SAZ*Na*<2*FD*SCr
- used in sorption experiments

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see initial entry 710/18-19 and 710/60

Surface Area Analyses of Standards and Known Materials.

Initial, before outgassing

Sample ID	Surface Area Analyses Sample ID	Mass(g) of tube, cap & insert	Aliquot Mass (g)
NIST-1899 Silicon nitride	1899S	29.0362	1.1120
NIST-8005 Alpha Alumina	8005S	28.6474	1.6742
Montmorillonite	Mont	29.4215	1.0106

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see initial entry: 710/18-19 and 710/60

Surface Area Analyses of Standards and Known Materials:

After outgassing

Sample ID	Surface Area Analyses Sample ID	Total Mass(g)	Outgassed * Sample Mass(g)
NIST-1899 Silicon nitride	1899S	30.1438	1.1076
NIST-8005 Alpha Alumina	8005S	30.3227	1.6742
Montmorillonite 710/60	MONT	30.2572	0.8357

*Calculation

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Sample ID: NIST-1899 Silicon nitride
Surface area analyses ID: 1899S
Mass(g) before outgassing: 710/61
Mass(g) after outgassing: 710/62

Serial No.	w46020	Software Version	2.13
Sample ID	1899S	Start Date	02/26/04
Customer	CNWRA	Start Time	03:06:20
Operator	MR	Elapsed Time	30 min
Sample Wt	1.1076 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	9.901 sq.m/g
Micropore Surface Area	0.738 sq.m/g
Micropore Volume	0.00023 ml/g
Correlation Coefficient	0.99997

Serial No.	w46020	Software Version	2.13
Sample ID	1899S	Start Date	02/26/04
Customer	CNWRA	Start Time	03:06:20
Operator	MR	Elapsed Time	30 min
Sample Wt	1.1076 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

t-Plot Surface Area Report

t-Plot Surface Area	9.901 sq.m/g
Total Surface Area	10.639 sq.m/g
Micropore Surface Area	0.738 sq.m/g
Micropore Volume	0.00023 ml/g
Film Thickness Range	0.35 to 0.50
Slope	6.4004
Intercept	0.14825
Correlation Coefficient	0.99997

Film Thickness (nm)	Vads (cc/g STP)
0.3516	2.394
0.3679	2.503
0.3829	2.600
0.3961	2.686
0.4099	2.773
0.4233	2.858
0.4364	2.942
0.4619	3.104
0.4880	3.270

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From Page No. 31 May 05 MR cont.

Sample ID	1899S	Start Date	02/26/04
Customer	CNWRA	Start Time	03:06:20
Operator	MR	Elapsed Time	30 min
Sample Wt	1.1076 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

Isotherm Data

Freespace Calculation

Slope	0.0191
Intercept	0.0029
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	748.84
0.0000	0.401	0.037	748.89
0.0004	0.797	0.292	748.88
0.0021	1.227	1.557	748.88
0.0070	1.581	5.223	748.85
0.0199	1.890	14.906	748.91
0.0347	2.070	25.991	748.90
0.0414	2.133	31.026	748.91
0.0501	2.203	37.490	748.87
0.0608	2.278	45.547	748.95
0.0701	2.338	52.542	749.06
0.0798	2.394	59.795	748.90
0.1001	2.503	74.976	748.92
0.1201	2.600	89.949	748.93
0.1388	2.686	103.929	748.90
0.1589	2.773	119.012	748.88
0.1791	2.858	134.140	748.86
0.1992	2.942	149.165	748.85
0.2390	3.104	178.946	748.80
0.2796	3.270	209.389	748.82
0.3189	3.434	238.778	748.81
0.3598	3.606	269.433	748.76
0.3992	3.780	298.953	748.83
0.4397	3.961	329.211	748.77

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Sample ID: NIST 8005 Alpha alumina
Surface area analyser ID: 8005S
mass(g) before outgassing: 710/61
mass(g) after outgassing: 710/62

Serial No.	w46020	Software Version	2.13

Sample ID	8005S	Start Date	02/26/04
Customer	CNWRA	Start Time	05:06:11
Operator	MR	Elapsed Time	27 min
Sample Wt	1.6742 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	1.742 sq.m/g
Micropore Surface Area	0.160 sq.m/g
Micropore Volume	0.00006 ml/g
Correlation Coefficient	0.99998

Serial No.	w46020	Software Version	2.13

Sample ID	8005S	Start Date	02/26/04
Customer	CNWRA	Start Time	05:06:11
Operator	MR	Elapsed Time	27 min
Sample Wt	1.6742 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

t-Plot Surface Area Report

t-Plot Surface Area	1.742 sq.m/g
Total Surface Area	1.902 sq.m/g
Micropore Surface Area	0.160 sq.m/g
Micropore Volume	0.00006 ml/g
Film Thickness Range	0.35 to 0.50
Slope	1.1259
Intercept	0.03731
Correlation Coefficient	0.99998

Film Thickness (nm)	Vads (cc/g STP)
0.3528	0.435
0.3678	0.452
0.3823	0.468
0.3966	0.484
0.4103	0.499
0.4236	0.514
0.4366	0.528
0.4624	0.558
0.4880	0.587

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Sample ID	8005S	Start Date	02/26/04
Customer	CNWRA	Start Time	05:06:11
Operator	MR	Elapsed Time	27 min
Sample Wt	1.6742 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

Isotherm Data

Freespace Calculation

Slope	0.0182
Intercept	0.0044
Correlation Coefficient	0.99999

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	750.58
0.0019	0.238	1.445	750.58
0.0140	0.332	10.489	750.60
0.0361	0.381	27.087	750.54
0.0426	0.391	31.959	750.61
0.0511	0.402	38.382	750.55
0.0600	0.413	45.038	750.57
0.0706	0.424	52.987	750.57
0.0813	0.435	61.043	750.56
0.1000	0.452	75.037	750.62
0.1193	0.468	89.535	750.56
0.1395	0.484	104.708	750.58
0.1596	0.499	119.789	750.60
0.1796	0.514	134.806	750.55
0.1996	0.528	149.805	750.59
0.2397	0.558	179.903	750.54
0.2796	0.587	209.889	750.55
0.3195	0.618	239.767	750.55
0.3597	0.650	269.943	750.52
0.3996	0.683	299.905	750.52
0.4396	0.717	329.927	750.52

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From Page No.____ 31 May 05 MR cont.
Sample ID: montmorillonite 710/60
Surface area analyses ID Mont
mass (g) before outgassing: 710/61
mass (g) after outgassing: 710/62

Serial No.	w46020	Software Version	2.13

Sample ID	MONT	Start Date	02/26/04
Customer	CNWRA	Start Time	06:21:17
Operator	MR	Elapsed Time	1 hrs 5 min
Sample Wt	0.8357 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	59.562 sq.m/g
Micropore Surface Area	46.846 sq.m/g
Micropore Volume	0.02076 ml/g
Correlation Coefficient	0.99883

Serial No.	w46020	Software Version	2.13

Sample ID	MONT	Start Date	02/26/04
Customer	CNWRA	Start Time	06:21:17
Operator	MR	Elapsed Time	1 hrs 5 min
Sample Wt	0.8357 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

t-Plot Surface Area Report

t-Plot Surface Area	59.562 sq.m/g
Total Surface Area	106.408 sq.m/g
Micropore Surface Area	46.846 sq.m/g
Micropore Volume	0.02076 ml/g
Film Thickness Range	0.35 to 0.50
Slope	38.5016
Intercept	13.41705
Correlation Coefficient	0.99883

Film Thickness (nm)	Vads (cc/g STP)
0.3519	26.840
0.3684	27.566
0.3805	28.074
0.3927	28.594
0.4073	29.175
0.4229	29.784
0.4347	30.227
0.4601	31.122
0.4871	32.047

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From Page No. 31 May 05 MR cont.

Sample ID	MONT	Start Date	02/26/04
Customer	CNWRA	Start Time	06:21:17
Operator	MR	Elapsed Time	1 hrs 5 min
Sample Wt	0.8357 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

Isotherm Data

Freespace Calculation

Slope	0.0194
Intercept	0.0045
Correlation Coefficient	0.99999

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	750.66
0.0000	0.534	0.025	750.69
0.0001	1.069	0.047	750.73
0.0001	1.688	0.073	750.74
0.0002	2.372	0.141	750.74
0.0002	3.039	0.143	750.77
0.0002	3.738	0.178	750.74
0.0002	4.493	0.178	750.74
0.0003	5.281	0.206	750.73
0.0003	6.128	0.207	750.75
0.0003	7.019	0.237	750.74
0.0003	7.967	0.239	750.71
0.0004	8.970	0.271	750.70
0.0004	10.033	0.287	750.71
0.0005	11.154	0.344	750.64
0.0005	12.354	0.404	750.64
0.0007	13.591	0.546	750.58
0.0010	14.829	0.717	750.64
0.0014	16.470	1.084	750.63
0.0020	17.703	1.509	750.57
0.0030	18.905	2.218	750.55
0.0046	20.090	3.443	750.55
0.0075	21.228	5.639	750.54
0.0103	21.927	7.765	750.48
0.0143	22.588	10.710	750.50
0.0192	23.207	14.412	750.46
0.0250	23.778	18.769	750.46
0.0290	24.102	21.792	750.45
0.0333	24.431	24.992	750.41
0.0385	24.751	28.894	750.31
0.0436	25.063	32.682	750.33
0.0486	25.362	36.486	750.32
0.0541	25.652	40.552	750.26
0.0578	25.853	43.387	750.25
0.0620	26.059	46.498	750.17
0.0710	26.461	53.287	750.20
0.0802	26.840	60.139	750.15
0.1008	27.566	75.572	750.09
0.1169	28.074	87.651	750.06
0.1339	28.594	100.457	750.04

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0.1551	29.175	116.327	750.07
0.1786	29.784	133.954	749.99
0.1966	30.227	147.499	750.08
0.2362	31.122	177.124	749.98
0.2783	32.047	208.711	750.02
0.3145	32.835	235.899	749.99
0.3582	33.760	268.638	749.94
0.4001	34.609	300.078	749.97
0.4421	35.436	331.588	749.95

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During surface area analysis the sample tube containing the montmorillonite aliquout slipped 31 May 05 MR spilled out of the knurled nut. The sample was disgarded. The surface area analyses process will be started again for montmorillonite from the initial stage of aliquot removal from ~~montmorillonit~~ 31 May 05 MR montmorillonite 061/94.

see initial entry: 710/60 SAZ*Na*<2*FD*Scr

Surface Area Analyses of Montmorillonite

initial, before outgassing

Sample ID	Surface Area Analyses Sample ID	Mass(g) of tube, cap and insert	Aliquot Mass(g)
Montmorillonite 710/60	MONT2	28.6461	1.0362

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See initial entry: 710/60 and entry 710/70

Surface Area Analyses of Montmorillonite After Outgassing

After outgassing

Sample ID	Surface Area Analyses Sample ID	Total Mass(g)	Outgassed Sample Mass(g)*
Montmorillonite 710/60	MONT2	29.5032	0.8571

*calculation

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From Page No. 1 June 05 MR

Sample ID: montmorillonite (710/60)
Surface area analyses ID: Mont2
Mass (g) before outgassing: 710/70
Mass (g) after outgassing: 710/71

Serial No.	w46020	Software Version	2.13
Sample ID	MONT2	Start Date	03/02/04
Customer	CNWRA	Start Time	02:58:37
Operator	MR	Elapsed Time	1 hrs 3 min
Sample Wt	0.8571 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	59.385 sq.m/g
Micropore Surface Area	46.318 sq.m/g
Micropore Volume	0.02055 ml/g
Correlation Coefficient	0.99905

Serial No.	w46020	Software Version	2.13
Sample ID	MONT2	Start Date	03/02/04
Customer	CNWRA	Start Time	02:58:37
Operator	MR	Elapsed Time	1 hrs 3 min
Sample Wt	0.8571 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

t-Plot Surface Area Report

t-Plot Surface Area	59.385 sq.m/g
Total Surface Area	105.703 sq.m/g
Micropore Surface Area	46.318 sq.m/g
Micropore Volume	0.02055 ml/g
Film Thickness Range	0.35 to 0.50
Slope	38.3872
Intercept	13.28532
Correlation Coefficient	0.99905

Film Thickness (nm)	Vads (cc/g STP)
0.3533	26.738
0.3681	27.383
0.3790	27.842
0.3929	28.411
0.4069	28.985
0.4218	29.551
0.4364	30.092
0.4590	30.894
0.4856	31.816

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From Page No. 1 June 05 MR cont.

Sample ID	MONT2	Start Date	03/02/04
Customer	CNWRA	Start Time	02:58:37
Operator	MR	Elapsed Time	1 hrs 3 min
Sample Wt	0.8571 g	Outgas Time	180 min
Profile	BET5-T	Outgas Temperature	200 C

Isotherm Data

Freespace Calculation

Slope	0.0191
Intercept	0.0020
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	741.03
0.0000	0.523	0.014	741.01
0.0000	1.041	0.031	741.00
0.0001	1.647	0.047	741.09
0.0001	2.320	0.096	741.13
0.0001	3.069	0.102	741.21
0.0002	3.903	0.131	741.20
0.0002	4.641	0.133	741.37
0.0002	5.413	0.152	741.44
0.0002	6.239	0.152	741.38
0.0002	7.110	0.178	741.55
0.0003	8.034	0.186	741.58
0.0003	9.011	0.213	741.53
0.0003	10.055	0.235	741.69
0.0004	11.157	0.287	741.71
0.0005	12.328	0.356	741.88
0.0007	13.949	0.554	742.04
0.0010	15.160	0.733	742.07
0.0014	16.359	1.009	742.04
0.0019	17.561	1.403	742.28
0.0028	18.745	2.097	742.35
0.0044	19.902	3.238	742.27
0.0072	21.016	5.340	742.38
0.0099	21.703	7.328	742.57
0.0136	22.355	10.116	742.41
0.0183	22.968	13.592	742.53
0.0240	23.539	17.842	742.58
0.0279	23.865	20.708	742.53
0.0322	24.190	23.900	742.50
0.0370	24.514	27.455	742.46
0.0420	24.827	31.176	742.43
0.0472	25.127	35.039	742.39
0.0525	25.419	38.985	742.38
0.0564	25.613	41.845	742.35
0.0603	25.819	44.779	742.42
0.0698	26.249	51.799	742.37
0.0819	26.738	60.821	742.34
0.1004	27.383	74.509	742.39
0.1148	27.842	85.257	742.43
0.1341	28.411	99.575	742.38
0.1545	28.985	114.693	742.39

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0.1769	29.551	131.310	742.32
0.1992	30.092	147.850	742.30
0.2344	30.894	174.020	742.33
0.2758	31.816	204.750	742.31
0.3171	32.688	235.454	742.42
0.3586	33.579	266.220	742.33
0.3977	34.370	295.235	742.30
0.4438	35.270	329.408	742.31

1 June 05 MR cont.

The total surface area (m^2/g) of NIST standards 1899 and 8005 were:

	Actual	Expected
NIST 1899	10.639 m^2/g	10.67 ± 0.19*
NIST 8005	1.902 m^2/g	2.09 ± 0.16*

- Actual values can be found 710/63-66.

The ~~montm~~ 1 June 05 MR montmorillonite aliquots (mont, mont2) resulted in higher than expected values:

	Actual
Mont	106.408 m^2/g
Mont2	105.703 m^2/g

From previous tests it was expected to be around 97 m^2/g.

*expected values taken from NIST CofAs for NIST-1899 & NIST 8005.

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Due to the discrepancy between the actual and expected values for montmorillonite, the montmorillonite will continue to be tested.

A change in method parameter will be as follows:

outgass time: from 180 mins to 720 mins.

For further information regarding experiment goals and procedures see initial entry 710/60 and 710/18-19.

For this particular experiment the Mont2 aliquot will be re-used # original Mont2 analyses 710/70-73

Surface Area Analyses of Montmorillonite

initial, before outgassing

Sample ID	Surface Area Analyses Sample ID	Total Mass (g) Mass (g) of tube, ~~1 June 05~~ 1 June 05 MR cap + insert	Aliquot Mass (g)
MONT2#	Mont3	29.5032	0.8571

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The total surface area (m^2/g) value for 18995 was within expected range (710/74). 8005S was slightly lower than the expected value (710/74).

As further explanation, the surface area analyses results of the montmorillonite mineral may vary with outgass time and temperature. (710/74-75).

Surface Area Analyses of NLEWDP22PC0305-"interval" <#35 will be delayed until optimum outgassing time and temperature can be determined.

2 June 05 MR

Surface Area Analyses of Montmorillonite Surface

After outgassing

Sample ID	Surface Area Analyses Sample ID	Total Mass (g)	Outgassed Aliquot Mass (g)*
Mont2	Mont3	29.5045	~~0.8504~~ 0.8604 (2 June 05 MR)

*calculation

2 June 05 MR

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Sample ID: Mont2 710/75

Surface area analyses ID: Mont3

Mass (g) before outgassing: 710/75

Mass (g) after outgassing 710/76

Serial No.	w46020	Software Version	2.13
Sample ID	MONT3	Start Date	03/03/04
Customer	CNWRA	Start Time	03:09:58
Operator	MR	Elapsed Time	1 hrs 8 min
Sample Wt	0.8604 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	200 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	59.412 sq.m/g
Micropore Surface Area	46.301 sq.m/g
Micropore Volume	0.02043 ml/g
Correlation Coefficient	0.99887

Serial No.	w46020	Software Version	2.13
Sample ID	MONT3	Start Date	03/03/04
Customer	CNWRA	Start Time	03:09:58
Operator	MR	Elapsed Time	1 hrs 8 min
Sample Wt	0.8604 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	200 C

t-Plot Surface Area Report

t-Plot Surface Area	59.412 sq.m/g
Total Surface Area	105.714 sq.m/g
Micropore Surface Area	46.301 sq.m/g
Micropore Volume	0.02043 ml/g
Film Thickness Range	0.35 to 0.50
Slope	38.4050
Intercept	13.20498
Correlation Coefficient	0.99887

Film Thickness (nm)	Vads (cc/g STP)
0.3533	26.650
0.3684	27.323
0.3785	27.747
0.3936	28.371
0.4077	28.931
0.4212	29.468
0.4351	29.992
0.4614	30.910
0.4873	31.800

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From Page No. 2 June 05 MR cont.

Sample ID	MONT3	Start Date	03/03/04
Customer	CNWRA	Start Time	03:09:58
Operator	MR	Elapsed Time	1 hrs 8 min
Sample Wt	0.8604 g	Outgas Time	720 min
Profile	BET5-T	Outgas Temperature	200 C

Isotherm Data

Freespace Calculation

Slope	0.0191
Intercept	0.0072
Correlation Coefficient	0.99998

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	743.72
0.0000	0.511	0.020	743.67
0.0001	1.032	0.039	743.68
0.0001	1.634	0.061	743.73
0.0002	2.296	0.123	743.75
0.0002	2.949	0.123	743.71
0.0002	3.781	0.160	743.76
0.0002	4.516	0.161	743.81
0.0003	5.290	0.186	743.82
0.0003	6.116	0.186	743.82
0.0003	6.985	0.217	743.85
0.0003	7.913	0.217	743.83
0.0003	8.888	0.247	743.84
0.0004	9.927	0.267	743.88
0.0004	11.016	0.322	743.89
0.0005	12.179	0.385	743.89
0.0008	13.791	0.580	743.87
0.0010	14.996	0.755	743.93
0.0014	16.194	1.038	743.92
0.0020	17.388	1.458	743.92
0.0028	18.571	2.119	743.92
0.0044	19.725	3.259	743.93
0.0070	20.839	5.240	743.90
0.0096	21.527	7.169	743.95
0.0132	22.189	9.831	743.95
0.0178	22.804	13.263	743.94
0.0233	23.378	17.322	743.90
0.0271	23.706	20.189	743.89
0.0314	24.035	23.364	743.86
0.0362	24.360	26.899	743.89
0.0411	24.674	30.539	743.89
0.0462	24.976	34.378	743.87
0.0515	25.271	38.296	743.87
0.0552	25.468	41.077	743.87
0.0592	25.670	44.065	743.80
0.0634	25.877	47.133	743.84
0.0698	26.165	51.882	743.77
0.0819	26.650	60.894	743.75
0.1008	27.323	74.967	743.77
0.1141	27.747	84.847	743.72
0.1353	28.371	100.595	743.72
0.1557	28.931	115.760	743.72

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0.1760	29.468	130.894	743.66
0.1972	29.992	146.649	743.64
0.2381	30.910	177.030	743.59
0.2786	31.800	207.136	743.56
0.3145	32.571	233.824	743.55
0.3583	33.488	266.423	743.50
0.3997	34.337	297.146	743.45
0.4409	35.161	327.727	743.38

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A literature search was conducted at the request of Paul Bertetti to determine the optimal parameters (temperature and time) for Brunauer-Emmett-Teller (BET) surface area measurements using nitrogen as a carrier (N-BET). Three documents provided helpful information and are referenced at the bottom of this entry.

N-BET surface area values increase significantly as a function of outgassing temperature.[1] When outgassing temperature is elevated, humidity can be removed from the interlayer sites of clays which results in more nitrogen adsorption and therefore a higher N-BET surface area value.[1] When outgassing temperature is increased over 230°C interlayer water will continued to be released, eventually resulting in the collapse of the layer structure of the clays and producing a low BET surface area value.[2]

Studies show a stable value of N-BET surface area can be acquired for clays, quartz, and calcite with an outgassing temperature of 200°C and an outgassing time of 6 hours.[3]

This literature review information was given to Paul, who decided all 59 surface area analyses for NC-EWDP-22PC-0305 'interval' <#35 samples will be analyzed using an outgassing temperature of 200°C and an outgassing time of 6 hours. The key was to lower the outgass temperature to prevent sample damage. These parameters are different from the original ones (350°C and 12 hours) listed in the initial entry (710/18-19). The 13 NC-EWDP-22PC-0305 'interval' <#35 samples analyzed prior to this method change (710/20-59) will be re-analyzed using the new method. These 13 samples will be re-analyzed after the other 46 samples are analyzed for the first time.

References:

[1] Metz Volker, Hadas Raanan, Heike Pieper, Dirk Bosbach and Jiwchar Ganor. (2005) Towards the establishment of a reliable proxy for the reactive surface area of smectite. *Geochimica et Cosmochimica Acta* **69** (10), 2581-2591.

[2] Velde B. (1992) *Introduction to Clay Minerals.* Chapman & Hall.

[3] Clausen, Liselotte and Ida Fabricius. (2000) BET Meausurements: Outgassing of Minerals. *Journal of Colloid and Interface Science* **227**, 7-15.

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see initial entry: 710/18-19 and 710/80
sample prefixes: NC-EWDP-22PC 0305 (1)

Surface Area Analyses of NC EWDP 22PC 0305 <#35 Sonic Core Samples Prior to outgassing

Before outgassing

Sample ID (1)	Surface Area Analyses Sample ID	Mass (g) of tube, cap & insert	Aliquot Mass (g)
595.0-596.6 <#35	22-596	29.7307	1.7664
715.0-717.1 <#35	22-716	~~29.53~~ 29.5238 9 June 05 MR	1.8197
753.2-754.9 <#35	~~22-5~~ 22-753 9 June 05 MR	29.3490	1.8091

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See initial entry: 710/18-19 and 710/80
Sample ID prefixes: NL EWDP 22PC 0305 (1)

Surface Area Analyses of NL EWDP 22PC 0305 <#35
Sonic Core Samples After Outgassing

After Outgassing

Sample ID (2)	Surface Area Analyses Sample ID	Total Mass (g)	Outgassed Aliquot Mass (g) *
595.0-596.6 <#35	22-596	31.3471	1.6164
715.0-717.1 <#35	22-716	31.2432	1.7194
753.2-754.9 <#35	22-753	31.0059	1.6569

* calculation

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Sample ID: NL EWDP 22PC 0305 595.0-596.6 <#35
Surface area analyses ID: 22-596
Mass (g) before outgassing: 710/81
Mass (g) after outgassing 710/82

Serial No.	w46020	Software Version	2.13
Sample ID	22-596	Start Date	03/11/04
Customer	CNWRA	Start Time	03:27:10
Operator	MR	Elapsed Time	42 min
Sample Wt	1.6164 g	Outgas Time	0 min
Profile	BET5-T	Outgas Temperature	200 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	14.413 sq.m/g
Micropore Surface Area	5.123 sq.m/g
Micropore Volume	0.00219 ml/g
Correlation Coefficient	0.99956

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-596	Start Date	03/11/04
Customer	CNWRA	Start Time	03:27:10
Operator	MR	Elapsed Time	42 min
Sample Wt	1.6164 g	Outgas Time	0 min
Profile	BET5-T	Outgas Temperature	200 C

t-Plot Surface Area Report

t-Plot Surface Area	14.413 sq.m/g
Total Surface Area	19.536 sq.m/g
Micropore Surface Area	5.123 sq.m/g
Micropore Volume	0.00219 ml/g
Film Thickness Range	0.35 to 0.50
Slope	9.3165
Intercept	1.41303
Correlation Coefficient	0.99956

Film Thickness (nm)	Vads (cc/g STP)
0.3518	4.671
0.3680	4.837
0.3808	4.964
0.3951	5.103
0.4090	5.235
0.4225	5.361
0.4357	5.482

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0.4615	5.712
0.4874	5.935

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-596	Start Date	03/11/04
Customer	CNWRA	Start Time	03:27:10
Operator	MR	Elapsed Time	42 min
Sample Wt	1.6164 g	Outgas Time	0 min
Profile	BET5-T	Outgas Temperature	200 C

Isotherm Data

Freespace Calculation

Slope	0.0162
Intercept	0.0034
Correlation Coefficient	0.99999

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	739.42
0.0000	0.273	0.016	739.47
0.0001	0.551	0.040	739.50
0.0001	0.873	0.066	739.53
0.0002	1.227	0.171	739.61
0.0003	1.573	0.234	739.65
0.0007	2.010	0.526	739.67
0.0014	2.386	1.018	739.67
0.0027	2.779	1.965	739.72
0.0050	3.176	3.668	739.77
0.0098	3.557	7.259	739.84
0.0181	3.843	13.360	739.92
0.0288	4.065	21.296	739.92
0.0352	4.168	26.028	739.97
0.0424	4.271	31.401	740.00
0.0509	4.377	37.680	740.05
0.0563	4.439	41.675	740.06
0.0624	4.503	46.162	740.10
0.0702	4.580	51.951	740.14
0.0801	4.671	59.314	740.10
0.1002	4.837	74.165	740.11
0.1172	4.964	86.762	740.12
0.1374	5.103	101.686	740.12
0.1577	5.235	116.731	740.14
0.1780	5.361	131.719	740.14
0.1982	5.482	146.678	740.16
0.2384	5.712	176.439	740.20
0.2787	5.935	206.264	740.15
0.3185	6.149	235.780	740.20
0.3594	6.366	266.022	740.18
0.3989	6.573	295.308	740.22
0.4403	6.787	325.913	740.18

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Sample ID: NCEWDP22PC0305 715.0-717.1 <#35
Surface area analyses ID: 22-716
Mass(g) before outgassing: 710/81
Mass(g) after outgassing: 716/82

Serial No.	w46020	Software Version	2.13
Sample ID	22-716	Start Date	03/11/04
Customer	CNWRA	Start Time	05:19:07
Operator	MR	Elapsed Time	34 min
Sample Wt	1.7194 g	Outgas Time	0 min
Profile	BET5-T	Outgas Temperature	200 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	8.769 sq.m/g
Micropore Surface Area	2.331 sq.m/g
Micropore Volume	0.00099 ml/g
Correlation Coefficient	0.99998

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-716	Start Date	03/11/04
Customer	CNWRA	Start Time	05:19:07
Operator	MR	Elapsed Time	34 min
Sample Wt	1.7194 g	Outgas Time	0 min
Profile	BET5-T	Outgas Temperature	200 C

t-Plot Surface Area Report

t-Plot Surface Area	8.769 sq.m/g
Total Surface Area	11.099 sq.m/g
Micropore Surface Area	2.331 sq.m/g
Micropore Volume	0.00099 ml/g
Film Thickness Range	0.35 to 0.50
Slope	5.6682
Intercept	0.64094
Correlation Coefficient	0.99998

Film Thickness (nm)	Vads (cc/g STP)
0.3520	2.634
0.3681	2.727
0.3814	2.803
0.3953	2.883
0.4094	2.963
0.4231	3.041
0.4362	3.115

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0.4620	3.258
0.4878	3.404

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-716	Start Date	03/11/04
Customer	CNWRA	Start Time	05:19:07
Operator	MR	Elapsed Time	34 min
Sample Wt	1.7194 g	Outgas Time	0 min
Profile	BET5-T	Outgas Temperature	200 C

Isotherm Data

Freespace Calculation

Slope	0.0173
Intercept	0.0020
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	742.81
0.0000	0.261	0.001	742.81
0.0000	0.518	0.026	742.87
0.0002	0.818	0.141	742.94
0.0008	1.143	0.626	742.95
0.0022	1.446	1.646	743.01
0.0049	1.748	3.636	743.06
0.0110	2.016	8.200	743.11
0.0232	2.220	17.267	743.14
0.0309	2.302	22.969	743.18
0.0389	2.373	28.906	743.23
0.0484	2.444	35.997	743.28
0.0579	2.506	43.028	743.30
0.0635	2.541	47.232	743.32
0.0708	2.583	52.659	743.35
0.0804	2.634	59.759	743.34
0.1003	2.727	74.553	743.38
0.1182	2.803	87.839	743.39
0.1377	2.883	102.359	743.41
0.1582	2.963	117.627	743.40
0.1788	3.041	132.909	743.40
0.1990	3.115	147.910	743.43
0.2391	3.258	177.736	743.40
0.2792	3.404	207.587	743.39
0.3184	3.545	236.694	743.39
0.3599	3.696	267.540	743.36
0.3997	3.842	297.134	743.37
0.4396	3.993	326.739	743.34

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Sample ID: NCEWDP22PC0305 753.2-754.9 <#35
Surface area analyses ID: 22-753
Mass(g) before outgassing: 710/81
Mass(g) after outgassing: 710/82

Serial No.	w46020	Software Version	2.13
Sample ID	22-753	Start Date	03/11/04
Customer	CNWRA	Start Time	06:19:37
Operator	MR	Elapsed Time	41 min
Sample Wt	1.6569 g	Outgas Time	0 min
Profile	BET5-T	Outgas Temperature	200 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	14.310 sq.m/g
Micropore Surface Area	4.601 sq.m/g
Micropore Volume	0.00197 ml/g
Correlation Coefficient	0.99977

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-753	Start Date	03/11/04
Customer	CNWRA	Start Time	06:19:37
Operator	MR	Elapsed Time	41 min
Sample Wt	1.6569 g	Outgas Time	0 min
Profile	BET5-T	Outgas Temperature	200 C

t-Plot Surface Area Report

t-Plot Surface Area	14.310 sq.m/g
Total Surface Area	18.911 sq.m/g
Micropore Surface Area	4.601 sq.m/g
Micropore Volume	0.00197 ml/g
Film Thickness Range	0.35 to 0.50
Slope	9.2503
Intercept	1.27441
Correlation Coefficient	0.99977

Film Thickness (nm)	Vads (cc/g STP)
0.3520	4.518
0.3678	4.673
0.3807	4.797
0.3947	4.932
0.4091	5.068
0.4230	5.196
0.4363	5.317

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0.4608	5.538
0.4870	5.765

Coulter SA 3100 Surface Area and Pore Size Analyzer
Analysis Report

Serial No.	w46020	Software Version	2.13
Sample ID	22-753	Start Date	03/11/04
Customer	CNWRA	Start Time	06:19:37
Operator	MR	Elapsed Time	41 min
Sample Wt	1.6569 g	Outgas Time	0 min
Profile	BET5-T	Outgas Temperature	200 C

Isotherm Data

Freespace Calculation

Slope	0.0173
Intercept	0.0045
Correlation Coefficient	0.99999

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	744.41
0.0000	0.269	0.009	744.43
0.0000	0.539	0.033	744.44
0.0001	0.852	0.073	744.45
0.0002	1.195	0.183	744.50
0.0003	1.530	0.246	744.54
0.0006	1.877	0.437	744.55
0.0011	2.247	0.853	744.59
0.0023	2.629	1.705	744.57
0.0044	3.021	3.246	744.62
0.0087	3.399	6.471	744.58
0.0163	3.684	12.154	744.55
0.0267	3.904	19.851	744.58
0.0330	4.005	24.577	744.56
0.0401	4.104	29.885	744.55
0.0484	4.205	35.999	744.55
0.0566	4.297	42.165	744.55
0.0618	4.351	46.031	744.54
0.0701	4.429	52.198	744.55
0.0803	4.518	59.797	744.53
0.1000	4.673	74.456	744.49
0.1172	4.797	87.231	744.49
0.1368	4.932	101.869	744.49
0.1578	5.068	117.482	744.42
0.1787	5.196	132.993	744.42
0.1991	5.317	148.233	744.37
0.2373	5.538	176.622	744.34
0.2780	5.765	206.943	744.29
0.3194	5.994	237.685	744.26
0.3587	6.210	266.993	744.27
0.3993	6.427	297.182	744.25
0.4406	6.649	327.932	744.25

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See initial entry: 710/18-19 and 710/80

Sample ID prefixes: ~~NCEWDC22PC0305~~ ① 13 June 05 MR
NCEWDP22PC0305 ①

Surface Area Analyses of NCEWDP22PC0305 <#35 Sonic Core Samples Prior to Outgassing

Before outgassing

Sample ID ①	Surface Area Analyses Sample ID	Mass (g) of tube, cap & insert	Aliquot Mass (g)
513.3-515.3 <#35	22-514	29.2970	1.7645
630.2-631.9 <#35	22-631	29.5859	1.8281
756.3-758.1 <#35	13 June 05 MR ~~22-5~~ 22-757	29.1068	1.9597

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See initial entry: 710/18-19 and 710180
Sample ID: NCEWDP22PC0305 ①

Surface area analyses of NCEWDP22PC 0305 <#35 Sonic Core Samples After Outgassing

After outgassing

Sample ID ①	Surface Area Analyses Sample ID	Total Mass (g)	Outgassed Aliquot Mass (g)*
513.3-515.3 <#35	22-514	30.9700	1.6730
630.2-631.9 <#35	22-631	31.2843	1.6984
756.3-758.1 <#35	22-757	30.9716	1.8648

*calculation

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Sample ID: NCEWDP22PC0305 513.3-515.3 <#35
Surface area analyses ID: 22-514
mass(g) before outgassing: 710189
mass(g) after outgassing: 710190

Serial No.	w46020	Software Version	2.13
Sample ID	22-514	Start Date	03/15/04
Customer	CNWRA	Start Time	02:30:15
Operator	MR	Elapsed Time	48 min
Sample Wt	1.673 g	Outgas Time	360 min
Profile	BET5-T	Outgas Temperature	200 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	17.050 sq.m/g
Micropore Surface Area	7.040 sq.m/g
Micropore Volume	0.00303 ml/g
Correlation Coefficient	0.99944

Serial No.	w46020	Software Version	2.13
Sample ID	22-514	Start Date	03/15/04
Customer	CNWRA	Start Time	02:30:15
Operator	MR	Elapsed Time	48 min
Sample Wt	1.673 g	Outgas Time	360 min
Profile	BET5-T	Outgas Temperature	200 C

t-Plot Surface Area Report

t-Plot Surface Area	17.050 sq.m/g
Total Surface Area	24.090 sq.m/g
Micropore Surface Area	7.040 sq.m/g
Micropore Volume	0.00303 ml/g
Film Thickness Range	0.35 to 0.50
Slope	11.0216
Intercept	1.95867
Correlation Coefficient	0.99944

Film Thickness (nm)	Vads (cc/g STP)
0.3518	5.811
0.3681	6.007
0.3805	6.155
0.3942	6.316
0.4088	6.480
0.4229	6.636
0.4356	6.771
0.4607	7.033
0.4871	7.303

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Customer	CNWRA	Start Time	02:30:15
Operator	MR	Elapsed Time	48 min
Sample Wt	1.673 g	Outgas Time	360 min
Profile	BET5-T	Outgas Temperature	200 C

Isotherm Data

Freespace Calculation

Slope	0.0179
Intercept	0.0032
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	747.23
0.0001	0.267	0.050	747.25
0.0002	0.531	0.124	747.28
0.0003	0.835	0.234	747.34
0.0003	1.148	0.256	747.34
0.0005	1.529	0.342	747.38
0.0005	1.881	0.403	747.40
0.0009	2.355	0.665	747.44
0.0013	2.743	0.997	747.57
0.0022	3.149	1.628	747.50
0.0035	3.571	2.636	747.58
0.0058	4.004	4.301	747.63
0.0100	4.427	7.512	747.73
0.0162	4.725	12.124	747.74
0.0246	4.971	18.386	747.78
0.0302	5.098	22.578	747.75
0.0364	5.219	27.237	747.83
0.0435	5.340	32.561	747.83
0.0509	5.450	38.048	747.90
0.0555	5.518	41.471	747.89
0.0608	5.589	45.497	747.93
0.0710	5.711	53.075	747.93
0.0801	5.811	59.896	747.91
0.1003	6.007	75.011	747.98
0.1168	6.155	87.383	747.97
0.1361	6.316	101.763	747.98
0.1573	6.480	117.637	747.96
0.1785	6.636	133.522	747.89
0.1980	6.771	148.052	747.89
0.2370	7.033	177.259	747.90
0.2782	7.303	208.030	747.84
0.3180	7.558	237.797	747.85
0.3589	7.821	268.381	747.84
0.3991	8.073	298.411	747.73
0.4412	8.334	329.916	747.78

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sample ID: NC EWDP 22PC 0305 630.2-631.9 <#35
surface area analyses ID: 22-631
mass(g) before outgassing: 710/89
mass(g) after outgassing: 710/90

Serial No.	w46020	Software Version	2.13
Sample ID	22-631	Start Date	03/15/04
Customer	CNWRA	Start Time	03:47:00
Operator	MR	Elapsed Time	46 min
Sample Wt	1.6984 g	Outgas Time	360 min
Profile	BET5-T	Outgas Temperature	200 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	13.188 sq.m/g
Micropore Surface Area	4.824 sq.m/g
Micropore Volume	0.00208 ml/g
Correlation Coefficient	0.99981

Serial No.	w46020	Software Version	2.13
Sample ID	22-631	Start Date	03/15/04
Customer	CNWRA	Start Time	03:47:00
Operator	MR	Elapsed Time	46 min
Sample Wt	1.6984 g	Outgas Time	360 min
Profile	BET5-T	Outgas Temperature	200 C

t-Plot Surface Area Report

t-Plot Surface Area	13.188 sq.m/g
Total Surface Area	18.011 sq.m/g
Micropore Surface Area	4.824 sq.m/g
Micropore Volume	0.00208 ml/g
Film Thickness Range	0.35 to 0.50
Slope	8.5247
Intercept	1.34449
Correlation Coefficient	0.99981

Film Thickness (nm)	Vads (cc/g STP)
0.3518	4.332
0.3687	4.483
0.3812	4.596
0.3941	4.711
0.4091	4.839
0.4232	4.960
0.4359	5.064
0.4613	5.274
0.4866	5.483

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Operator	MR	Elapsed Time	46 min
Sample Wt	1.6984 g	Outgas Time	360 min
Profile	BET5-T	Outgas Temperature	200 C

Isotherm Data

Freespace Calculation

Slope	0.0164
Intercept	0.0028
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	750.14
0.0001	0.259	0.057	750.14
0.0001	0.522	0.100	750.12
0.0002	0.826	0.161	750.21
0.0004	1.159	0.327	750.24
0.0006	1.486	0.414	750.22
0.0011	1.899	0.796	750.19
0.0018	2.258	1.343	750.23
0.0033	2.623	2.445	750.25
0.0058	2.995	4.377	750.26
0.0112	3.346	8.429	750.29
0.0199	3.602	14.953	750.33
0.0307	3.799	23.051	750.29
0.0370	3.892	27.779	750.31
0.0443	3.983	33.266	750.33
0.0527	4.080	39.534	750.24
0.0582	4.137	43.677	750.26
0.0642	4.195	48.174	750.25
0.0704	4.250	52.781	750.26
0.0801	4.332	60.110	750.24
0.1011	4.483	75.819	750.19
0.1178	4.596	88.392	750.17
0.1360	4.711	101.995	750.16
0.1578	4.839	118.340	750.12
0.1789	4.960	134.224	750.12
0.1984	5.064	148.836	750.10
0.2379	5.274	178.461	750.07
0.2775	5.483	208.126	750.08
0.3188	5.697	239.085	750.04
0.3593	5.911	269.540	750.10
0.3994	6.112	299.554	750.05
0.4405	6.327	330.408	750.05

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Sample ID: NCEHDP22PC 0805 756.3-758.1 <#35
Surface area analyses ID: 22-757
mass(g) before outgassing: 710189
mass(g) after outgassing: 710190

Serial No.	W46020	Software Version	2.13
Sample ID	22-757	Start Date	03/15/04
Customer	CNWRA	Start Time	05:41:47
Operator	MR	Elapsed Time	40 min
Sample Wt	1.8648 g	Outgas Time	360 min
Profile	BET5-T	Outgas Temperature	200 C

Summary

t-Plot Surface Area Report

t-Plot Surface Area	12.008 sq.m/g
Micropore Surface Area	3.808 sq.m/g
Micropore Volume	0.00163 ml/g
Correlation Coefficient	0.99992

Serial No.	W46020	Software Version	2.13
Sample ID	22-757	Start Date	03/15/04
Customer	CNWRA	Start Time	05:41:47
Operator	MR	Elapsed Time	40 min
Sample Wt	1.8648 g	Outgas Time	360 min
Profile	BET5-T	Outgas Temperature	200 C

t-Plot Surface Area Report

t-Plot Surface Area	12.008 sq.m/g
Total Surface Area	15.815 sq.m/g
Micropore Surface Area	3.808 sq.m/g
Micropore Volume	0.00163 ml/g
Film Thickness Range	0.35 to 0.50
Slope	7.7618
Intercept	1.05593
Correlation Coefficient	0.99992

Film Thickness (nm)	Vads (cc/g STP)
0.3520	3.781
0.3684	3.914
0.3804	4.010
0.3949	4.125
0.4091	4.236
0.4229	4.342
0.4361	4.443
0.4611	4.633
0.4870	4.831

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Customer	CNWRA	Start Time	05:41:47
Operator	MR	Elapsed Time	40 min
Sample Wt	1.8648 g	Outgas Time	360 min
Profile	BET5-T	Outgas Temperature	200 C

Isotherm Data

Freespace Calculation

Slope	0.0177
Intercept	0.0026
Correlation Coefficient	1.00000

Isotherm Data Table

Ps/Po	Vads cc/g(STP)	Ps mmHg	Po mmHg
0.0000	0.000	0.001	751.57
0.0001	0.237	0.038	751.57
0.0001	0.478	0.078	751.59
0.0002	0.757	0.121	751.51
0.0003	1.063	0.261	751.56
0.0005	1.362	0.364	751.54
0.0011	1.737	0.808	751.50
0.0020	2.060	1.508	751.48
0.0037	2.388	2.765	751.47
0.0069	2.714	5.190	751.43
0.0132	2.987	9.899	751.39
0.0229	3.197	17.229	751.39
0.0291	3.295	21.893	751.30
0.0361	3.384	27.113	751.31
0.0443	3.473	33.289	751.28
0.0525	3.554	39.406	751.23
0.0577	3.602	43.316	751.15
0.0637	3.654	47.813	751.10
0.0701	3.706	52.643	751.10
0.0804	3.781	60.363	751.04
0.1008	3.914	75.670	751.03
0.1168	4.010	87.702	751.04
0.1371	4.125	102.946	750.96
0.1578	4.236	118.477	750.89
0.1785	4.342	134.050	750.90
0.1989	4.443	149.307	750.84
0.2377	4.633	178.433	750.80
0.2781	4.831	208.774	750.79
0.3184	5.033	239.023	750.69
0.3595	5.232	269.890	750.68
0.4005	5.436	300.643	750.60
0.4388	5.625	329.324	750.54

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END OF SCIENTIFIC NOTE BOOK
ENTRIES CONTINUED IN SN 721

I have reviewed this scientific notebook and find it in agreement with QAP-001. There is sufficient information regarding methods used for conducting tests, acquiring and analyzing data so that another qualified individual could repeat the activity.

E. C. Pearl 7/6/2005

To Page No.

Witnessed & Understood by me, Date | Invented by | Date
Recorded by