Quantachrome TouchWin™

version 1.11

Report date: Tue Jun 12 2018 **Operator:** earl Decker
Filename: 20-20 - St1_20180507_180124.qcuPhysIso

Analysis Data

Sample

ID 1 **Weight** 0.194 g
Description eng1

Analysis

Data ID {7c7ee497-6f84-46fe-99a1-f7babf3e7b2a}
Operator Earl Decker **Date** 2018.05.07 **Duration** 693.183 min
Instrument St 1 on NOVA touch 4LX [s/n:17016111501] **Firmware** 1.02
Comments ""
Ambient Temp. 0 °C **Void Volume Mode** He Measure **Cold Zone** 3.81063 mL
Warm Zone 4.03432 mL **Cell Type** 9mm with rod **Thermal Delay** 120 sec
Po Mode Continuous

Adsorbate

Name Nitrogen **Molecular Weight** 28.013 g/mol **Cross Section Area** 16.2 Å²/mol
Non-ideality 6.58e-005 1/torr **Bath Temperature** 77.35 K

Degas information

Time 0 hours **Temp.** 0 °C

Data Reduction Parameters

Data Reduction Parameters

Thermal Transpiration no

DFT Method

Model N2 @ 77K on carbon (slit pore)(NLDFT Equ. model)
Min P/Po 0 **Max P/Po** 1 **Moving pt. avg.** off

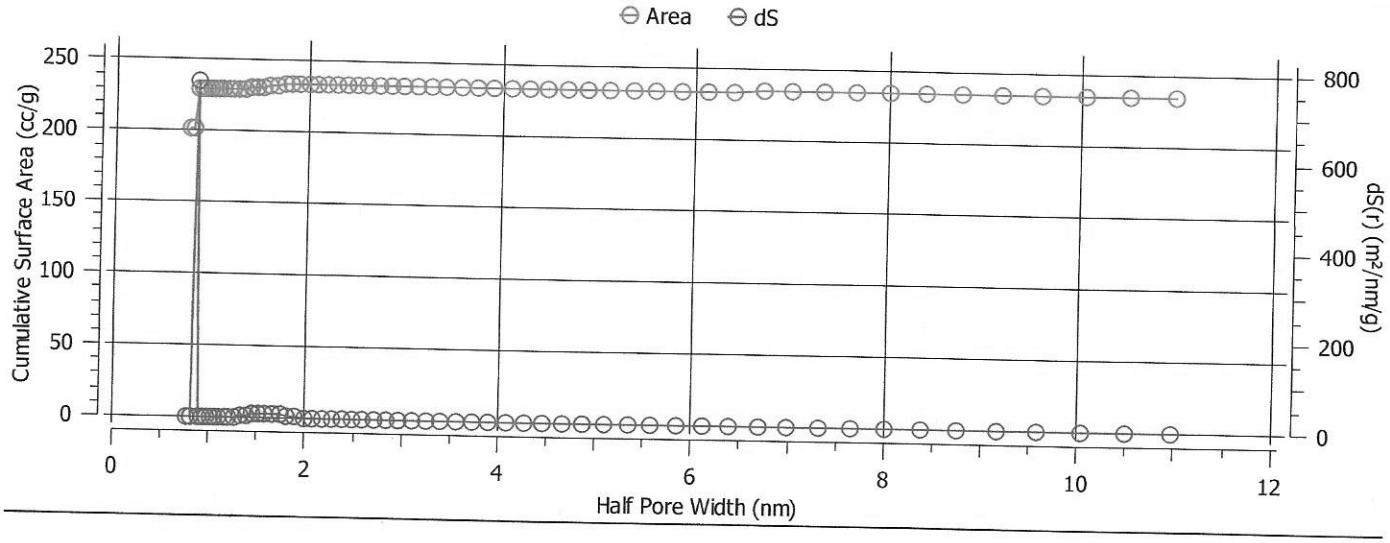
Adsorbate Model

Name Nitrogen **Molecular Weight** 28.0134 g **Cross Section Area** 16.2 Å²/molec
Bath Temperature 77.35 K

DFT method Summary/Results

Pore Volume 0.1132 cc/g **Surface Area** 235.3852 m²/g **Lower Confidence Limit** 0.7713 nm
Mode (Half Pore Width) 0.8440 nm **Fitting Error** 0.1044 % **Notes** Desorption data (augm

DFT method-Surface Area



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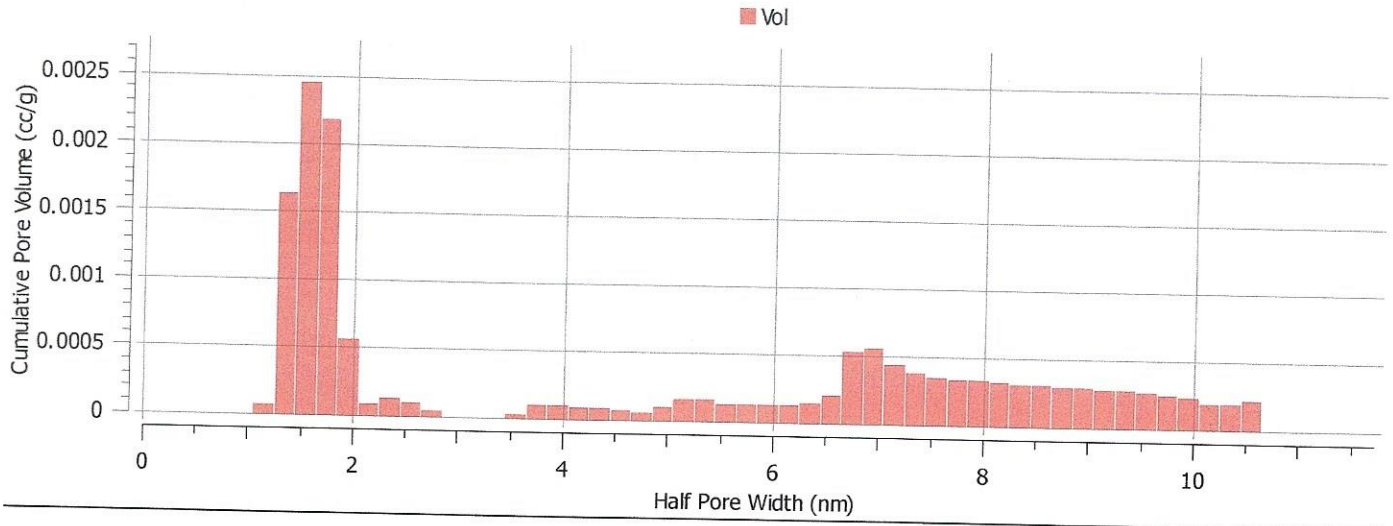
DFT method-Histogram-Volume (linear)



DFT method-Pore Size Distribution

Half Pore Width nm	Cumulative Pore Volume cc/g	Cumulative Surface Area m²/g	dV(r) cc/nm/g	dS(r) m²/nm/g
0.771330	7.3835e-02	2.0194e+02	0.0000e+00	0.0000e+00
0.806833	7.3835e-02	2.0194e+02	0.0000e+00	0.0000e+00
0.843970	9.7336e-02	2.2979e+02	6.3280e-01	7.4980e+02
0.882816	9.7336e-02	2.2979e+02	0.0000e+00	0.0000e+00
0.923450	9.7336e-02	2.2979e+02	0.0000e+00	0.0000e+00
0.965954	9.7336e-02	2.2979e+02	0.0000e+00	0.0000e+00
1.01041	9.7336e-02	2.2979e+02	0.0000e+00	0.0000e+00
1.05692	9.7336e-02	2.2979e+02	0.0000e+00	0.0000e+00
1.10557	9.7336e-02	2.2979e+02	0.0000e+00	0.0000e+00
1.15646	9.7336e-02	2.2979e+02	0.0000e+00	0.0000e+00
1.20969	9.7336e-02	2.2979e+02	0.0000e+00	0.0000e+00
1.26537	9.7428e-02	2.2986e+02	1.6581e-03	1.3105e+00
1.32361	9.7883e-02	2.3020e+02	7.8088e-03	5.8995e+00
1.38453	9.8255e-02	2.3047e+02	6.1132e-03	4.4154e+00
1.44826	9.9024e-02	2.3100e+02	1.2061e-02	8.3282e+00
1.51492	9.9844e-02	2.3154e+02	1.2308e-02	8.1245e+00
1.58465	1.0063e-01	2.3204e+02	1.1250e-02	7.0991e+00
1.65758	1.0160e-01	2.3263e+02	1.3333e-02	8.0434e+00
1.73388	1.0257e-01	2.3319e+02	1.2711e-02	7.3309e+00
1.81369	1.0347e-01	2.3368e+02	1.1260e-02	6.2083e+00
1.89717	1.0395e-01	2.3394e+02	5.7680e-03	3.0404e+00
1.98449	1.0423e-01	2.3408e+02	3.1803e-03	1.6025e+00
2.07583	1.0425e-01	2.3409e+02	2.3973e-04	1.1560e-01
2.17138	1.0428e-01	2.3410e+02	2.9406e-04	1.3543e-01
2.27132	1.0435e-01	2.3413e+02	7.1611e-04	3.1527e-01
2.37586	1.0442e-01	2.3416e+02	7.1410e-04	3.0052e-01
2.48522	1.0448e-01	2.3418e+02	4.8210e-04	1.9395e-01
2.59961	1.0454e-01	2.3421e+02	5.6073e-04	2.1570e-01
2.71926	1.0460e-01	2.3423e+02	4.7902e-04	1.7624e-01
2.84443	1.0461e-01	2.3423e+02	5.5182e-05	1.9384e-02
2.97535	1.0461e-01	2.3423e+02	0.0000e+00	0.0000e+00
3.11230	1.0461e-01	2.3423e+02	0.0000e+00	0.0000e+00
3.25555	1.0461e-01	2.3423e+02	0.0000e+00	0.0000e+00
3.40540	1.0461e-01	2.3423e+02	0.0000e+00	0.0000e+00

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Report date: Tue Jun 12 2018 **Operator:** earl Decker

Filename: 20-20 - St1_20180507_180124.qcuPhysIso

DFT method-Pore Size Distribution continued...

Half Pore Width nm	Cumulative Pore Volume cc/g	Cumulative Surface Area m²/g	dV(r) cc/nm/g	dS(r) m²/nm/g
3.56214	1.0461e-01	2.3423e+02	0.0000e+00	0.0000e+00
3.72610	1.0467e-01	2.3425e+02	3.9948e-04	1.0721e-01
3.89760	1.0477e-01	2.3427e+02	5.4659e-04	1.4022e-01
4.07700	1.0486e-01	2.3430e+02	5.4493e-04	1.3371e-01
4.26465	1.0495e-01	2.3432e+02	4.5921e-04	1.0766e-01
4.46095	1.0504e-01	2.3434e+02	4.4861e-04	1.0051e-01
4.66628	1.0512e-01	2.3435e+02	3.8906e-04	8.3381e-02
4.88105	1.0517e-01	2.3436e+02	2.5396e-04	5.2075e-02
5.10572	1.0530e-01	2.3439e+02	5.6590e-04	1.1084e-01
5.34072	1.0552e-01	2.3443e+02	9.4214e-04	1.7641e-01
5.58655	1.0569e-01	2.3446e+02	6.8222e-04	1.2210e-01
5.84368	1.0586e-01	2.3449e+02	6.5180e-04	1.1156e-01
6.11265	1.0604e-01	2.3452e+02	6.7569e-04	1.1051e-01
6.39401	1.0622e-01	2.3455e+02	6.5218e-04	1.0201e-01
6.68831	1.0652e-01	2.3459e+02	1.0179e-03	1.5217e-01
6.99616	1.0745e-01	2.3473e+02	3.0328e-03	4.3350e-01
7.31818	1.0817e-01	2.3482e+02	2.2175e-03	3.0303e-01
7.65502	1.0878e-01	2.3490e+02	1.8036e-03	2.3560e-01
8.00736	1.0938e-01	2.3498e+02	1.7025e-03	2.1259e-01
8.37592	1.0997e-01	2.3505e+02	1.6140e-03	1.9272e-01
8.76145	1.1056e-01	2.3512e+02	1.5293e-03	1.7454e-01
9.16472	1.1114e-01	2.3518e+02	1.4437e-03	1.5752e-01
9.58655	1.1172e-01	2.3524e+02	1.3651e-03	1.4241e-01
10.0278	1.1226e-01	2.3529e+02	1.2302e-03	1.2266e-01
10.4894	1.1270e-01	2.3534e+02	9.4721e-04	9.0318e-02
10.9722	1.1324e-01	2.3539e+02	1.1143e-03	1.0155e-01

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Report date: Tue Jun 12 2018 **Operator:** earl Decker
Filename: 20-20 - St2_20180507_180124.qcuPhysIso

Analysis Data

Sample

ID 2 **Weight** 0.2584 g
Description eng2

Analysis

Data ID {52540188-fe59-4bd6-a5d9-3600221658ed}
Operator Earl Decker **Date** 2018.05.07 **Duration** 625.483 min
Instrument St 2 on NOVA touch 4LX [s/n:17016111501] **Firmware** 1.02
Comments
Ambient Temp. 0 °C **Void Volume Mode** He Measure **Cold Zone** 3.81653 mL
Warm Zone 3.93411 mL **Cell Type** 9mm with rod **Thermal Delay** 120 sec
Po Mode Continuous

Adsorbate

Name Nitrogen **Molecular Weight** 28.013 g/mol **Cross Section Area** 16.2 Å²/mol
Non-ideality 6.58e-005 1/torr **Bath Temperature** 77.35 K

Degas information

Time 0 hours **Temp.** 0 °C

Data Reduction Parameters

Data Reduction Parameters

Thermal Transpiration no

DFT Method

Model N2 @ 77K on carbon (slit pore)(NLDFT Equ. model)
Min P/Po 0 **Max P/Po** 1 **Moving pt. avg.** off

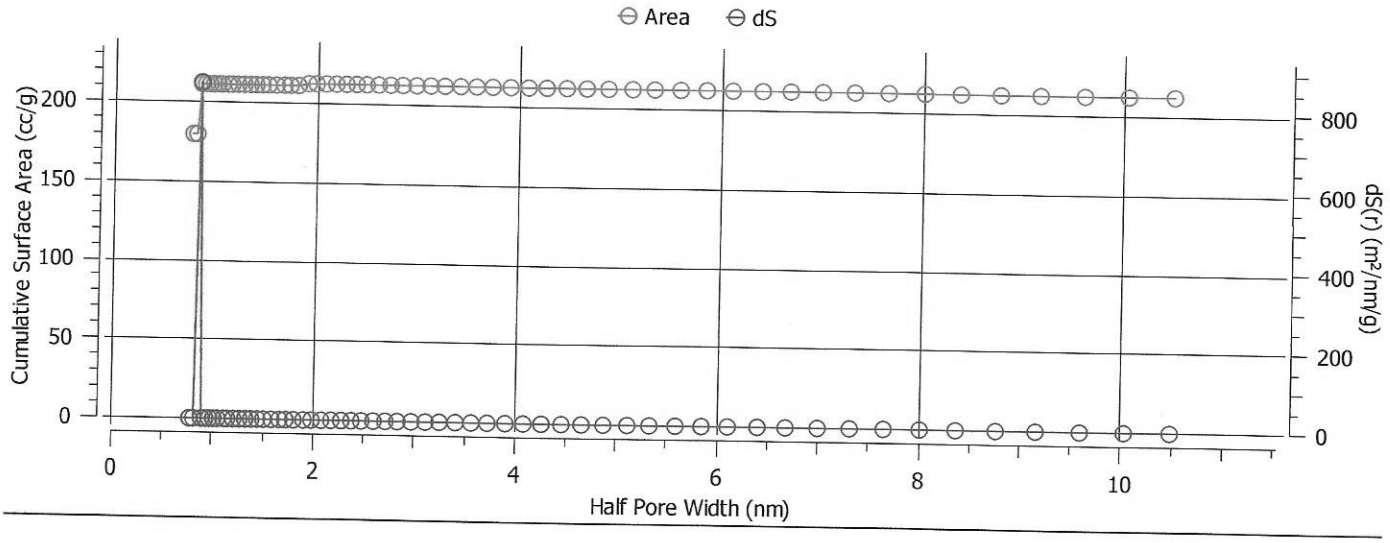
Adsorbate Model

Name Nitrogen **Molecular Weight** 28.0134 g **Cross Section Area** 16.2 Å²/molec
Bath Temperature 77.35 K

DFT method Summary/Results

Pore Volume 0.0854 cc/g **Surface Area** 212.7494 m²/g **Lower Confidence Limit** 0.7713 nm
Mode (Half Pore Width) 0.8440 nm **Fitting Error** 0.1590 % **Notes** Desorption data (augm

DFT method-Surface Area



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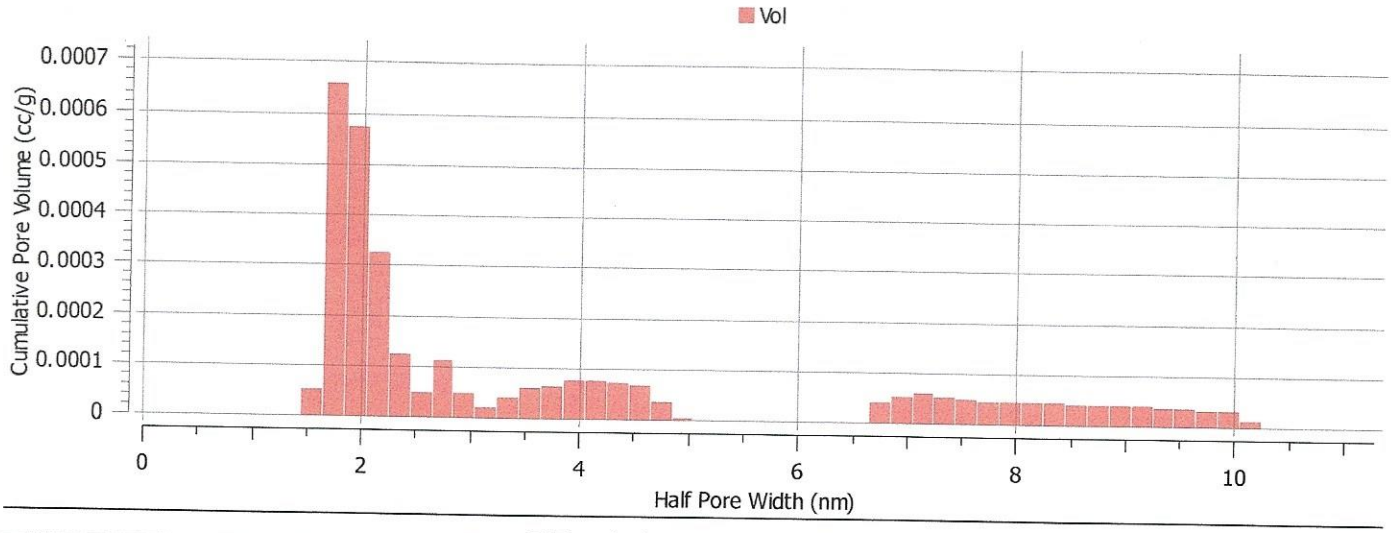
DFT method-Histogram-Volume (linear)



DFT method-Pore Size Distribution

Half Pore Width nm	Cumulative Pore Volume cc/g	Cumulative Surface Area m²/g	dV(r) cc/nm/g	dS(r) m²/nm/g
0.771330	5.5627e-02	1.8009e+02	0.0000e+00	0.0000e+00
0.806833	5.5627e-02	1.8009e+02	0.0000e+00	0.0000e+00
0.843970	8.2197e-02	2.1157e+02	7.1548e-01	8.4776e+02
0.882816	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
0.923450	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
0.965954	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.01041	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.05692	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.10557	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.15646	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.20969	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.26537	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.32361	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.38453	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.44826	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.51492	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.58465	8.2197e-02	2.1157e+02	0.0000e+00	0.0000e+00
1.65758	8.2255e-02	2.1160e+02	7.9268e-04	4.7803e-01
1.73388	8.2489e-02	2.1174e+02	3.0662e-03	1.7686e+00
1.81369	8.2772e-02	2.1190e+02	3.5483e-03	1.9563e+00
1.89717	8.3085e-02	2.1206e+02	3.7500e-03	1.9766e+00
1.98449	8.3369e-02	2.1220e+02	3.2533e-03	1.6394e+00
2.07583	8.3530e-02	2.1228e+02	1.7590e-03	8.4729e-01
2.17138	8.3661e-02	2.1234e+02	1.3699e-03	6.3098e-01
2.27132	8.3848e-02	2.1242e+02	1.8676e-03	8.2215e-01
2.37586	8.3930e-02	2.1246e+02	7.8971e-04	3.3249e-01
2.48522	8.3930e-02	2.1246e+02	0.0000e+00	0.0000e+00
2.59961	8.3951e-02	2.1247e+02	1.7951e-04	6.8964e-02
2.71926	8.4019e-02	2.1249e+02	5.7230e-04	2.1054e-01
2.84443	8.4091e-02	2.1252e+02	5.7248e-04	2.0128e-01
2.97535	8.4121e-02	2.1253e+02	2.2832e-04	7.6689e-02
3.11230	8.4159e-02	2.1254e+02	2.7893e-04	8.9581e-02
3.25555	8.4160e-02	2.1254e+02	5.0450e-06	1.5978e-03
3.40540	8.4188e-02	2.1255e+02	1.8765e-04	5.5090e-02

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Report date: Tue Jun 12 2018 **Operator:** earl Decker

Filename: 20-20 - St2_20180507_180124.qcuPhysIso

DFT method-Pore Size Distribution continued...

Half Pore Width nm	Cumulative Pore Volume cc/g	Cumulative Surface Area m²/g	dV(r) cc/nm/g	dS(r) m²/nm/g
3.56214	8.4234e-02	2.1256e+02	2.9371e-04	8.2455e-02
3.72610	8.4284e-02	2.1257e+02	3.0519e-04	8.1898e-02
3.89760	8.4340e-02	2.1259e+02	3.2421e-04	8.3187e-02
4.07700	8.4411e-02	2.1261e+02	3.9666e-04	9.7304e-02
4.26465	8.4480e-02	2.1262e+02	3.6817e-04	8.6354e-02
4.46095	8.4551e-02	2.1264e+02	3.6450e-04	8.1699e-02
4.66628	8.4619e-02	2.1265e+02	3.2737e-04	7.0153e-02
4.88105	8.4654e-02	2.1266e+02	1.6561e-04	3.3888e-02
5.10572	8.4654e-02	2.1266e+02	0.0000e+00	0.0000e+00
5.34072	8.4654e-02	2.1266e+02	0.0000e+00	0.0000e+00
5.58655	8.4654e-02	2.1266e+02	0.0000e+00	0.0000e+00
5.84368	8.4654e-02	2.1266e+02	0.0000e+00	0.0000e+00
6.11265	8.4654e-02	2.1266e+02	0.0000e+00	0.0000e+00
6.39401	8.4654e-02	2.1266e+02	0.0000e+00	0.0000e+00
6.68831	8.4654e-02	2.1266e+02	0.0000e+00	0.0000e+00
6.99616	8.4730e-02	2.1267e+02	2.4531e-04	3.5093e-02
7.31818	8.4825e-02	2.1268e+02	2.9586e-04	4.0419e-02
7.65502	8.4906e-02	2.1269e+02	2.4010e-04	3.1347e-02
8.00736	8.4986e-02	2.1270e+02	2.2696e-04	2.8366e-02
8.37592	8.5065e-02	2.1271e+02	2.1582e-04	2.5751e-02
8.76145	8.5145e-02	2.1272e+02	2.0617e-04	2.3550e-02
9.16472	8.5223e-02	2.1273e+02	1.9303e-04	2.1076e-02
9.58655	8.5300e-02	2.1274e+02	1.8233e-04	1.8991e-02
10.0278	8.5372e-02	2.1275e+02	1.6468e-04	1.6426e-02
10.4894	8.5404e-02	2.1275e+02	6.9024e-05	6.5788e-03

SAMPLE NAME:	MOISTURE
LOT NUMBER:	ENGINEERED CARBON
PRODUCT ID:	9.32.18 SAM 1
DATE:	01-Oct-2018
TIME OF DAY:	10:44
FINAL RESULT:	6.6290%
RESULT TYPE:	% Moisture
TEST MODE:	Rate
LAST ACTUAL:	6.6290%
START WEIGHT:	4.4729g
START WT TARGET:	4.0g +/- 1.0g
END WEIGHT:	4.1764g
TEST DURATION:	18:40
START TEMP:	33C
TEST TEMP:	110C
HI START TEMP:	25C
TEMP RATE:	0C/Minute
PAN TARE:	Standard
SAMPLE TARE:	Start After 5s
END RATE:	0.0984%/Minute
RATE TARGET:	0.1000%/Minute
END RELIABILITY:	0.0%
RELIABILITY TARGET:	90%
CORRELATION CONSTANT:	0.0000% Moisture
ASHING RATE:	0.0%/Minute
LINKED TO NEXT TEST:	Yes
LINK-RESULT TYPE:	Individual
LINK-USE FOR TOTAL:	Yes

DATE:	01-Oct-2018
TIME OF DAY:	10:48
FINAL RESULT:	98.5020%
RESULT TYPE:	% Solids
TEST MODE:	Temp->Rate
LAST ACTUAL:	98.5020%
START WEIGHT:	4.1764g
START WT TARGET:	4.0g +/- 0.5g
END WEIGHT:	4.1139g
TEST DURATION:	4:21
START TEMP:	110C
TEST TEMP:	270C
HI START TEMP:	25C
TEMP RATE:	0C/Minute
PAN TARE:	Standard
SAMPLE TARE:	Start After 5s
END RATE:	0.0970%/Minute
RATE TARGET:	0.1000%/Minute
END RELIABILITY:	0.0%
RELIABILITY TARGET:	90%
CORRELATION CONSTANT:	0.0000% Moisture
ASHING RATE:	7.0%/Minute
LINKED TO NEXT TEST:	Yes
LINK-RESULT TYPE:	Individual
LINK-USE FOR TOTAL:	No

TEST MODE:	Temp->Rate
LAST ACTUAL:	2.0856%
START WEIGHT:	4.1139g
START WT TARGET:	4.0g +/- 1.0g
END WEIGHT:	0.0858g
TEST DURATION:	120:00
START TEMP:	270C
TEST TEMP:	570C
HI START TEMP:	25C
TEMP RATE:	0C/Minute
PAN TARE:	Standard
SAMPLE TARE:	Start After 8s
END RATE:	0.1125%/Minute
RATE TARGET:	0.1000%/Minute
END RELIABILITY:	0.0%
RELIABILITY TARGET:	90%
CORRELATION CONSTANT:	0.0000% Moisture
ASHING RATE:	7.0%/Minute
LINKED TO NEXT TEST:	No
LINK-RESULT TYPE:	Individual
LINK-USE FOR TOTAL:	No

FINAL RESULT:	7.5382%
RESULT TYPE:	% Moisture
TEST MODE:	Rate
LAST ACTUAL:	7.5382%
START WEIGHT:	3.4760g
START WT TARGET:	4.0g +/- 1.0g
END WEIGHT:	3.2139g
TEST DURATION:	15:02
START TEMP:	26C
TEST TEMP:	110C
HI START TEMP:	25C
TEMP RATE:	0C/Minute
PAN TARE:	Standard
SAMPLE TARE:	Start After 5s
END RATE:	0.0998%/Minute
RATE TARGET:	0.1000%/Minute
END RELIABILITY:	0.0%
RELIABILITY TARGET:	90%
CORRELATION CONSTANT:	0.0000% Moisture
ASHING RATE:	0.0%/Minute
LINKED TO NEXT TEST:	Yes
LINK-RESULT TYPE:	Individual
LINK-USE FOR TOTAL:	Yes

COMPUTRAC MAX 5000XL TEST REVIEW REPORT

COMPANY: CBG INSTRUMENT #: 500551

SAMPLE NAME:	LUMP CHARCOAL
LOT NUMBER:	ENGINEERED CARBON
PRODUCT ID:	9.12.18 SAM 1
DATE:	01-Oct-2018
TIME OF DAY:	08:06
FINAL RESULT:	98.3007%
RESULT TYPE:	% Solids
TEST MODE:	Temp->Rate
LAST ACTUAL:	98.3007%
START WEIGHT:	3.2139g
START WT TARGET:	4.0g +/- 0.5g
END WEIGHT:	3.1593g
TEST DURATION:	5:05
START TEMP:	110C
TEST TEMP:	270C
HI START TEMP:	25C
TEMP RATE:	0C/Minute
PAN TARE:	Standard
SAMPLE TARE:	Start After 5s
END RATE:	0.0969%/Minute
RATE TARGET:	0.1000%/Minute
END RELIABILITY:	0.0%
RELIABILITY TARGET:	90%
CORRELATION CONSTANT:	0.0000% Moisture
ASHING RATE:	7.0%/Minute
LINKED TO NEXT TEST:	Yes
LINK-RESULT TYPE:	Individual
LINK-USE FOR TOTAL:	No

PRODUCT ID: 9.12.18 SAM 1
DATE: 01-Oct-2018
TIME OF DAY: 08:06
FINAL RESULT: 98.3007%
RESULT TYPE: % Solids
TEST MODE: Temp->Rate
LAST ACTUAL: 98.3007%
START WEIGHT: 3.2139g
START WT TARGET: 4.0g +/- 0.5g
END WEIGHT: 3.1593g
TEST DURATION: 5:05
START TEMP: 110C
TEST TEMP: 270C
HI START TEMP: 25C
TEMP RATE: 0C/Minute
PAN TARE: Standard
SAMPLE TARE: Start After 5s
END RATE: 0.0969%/Minute
RATE TARGET: 0.1000%/Minute
END RELIABILITY: 0.0%
RELIABILITY TARGET: 90%
CORRELATION CONSTANT: 0.0000% Moisture
ASHING RATE: 7.0%/Minute
LINKED TO NEXT TEST: Yes
LINK-RESULT TYPE: Individual
LINK-USE FOR TOTAL: No

COMPUTRAC MAX 5000XL TEST REVIEW REPORT

COMPANY: CBG

INSTRUMENT #: 500551

SAMPLE NAME: ASH
LOT NUMBER: ENGINEERED CARBON
PRODUCT ID: 9.12.18 SAM 1
DATE: 01-Oct-2018
TIME OF DAY: 09:42
FINAL RESULT: 2.4786%
RESULT TYPE: % Ash
TEST MODE: Temp->Rate
LAST ACTUAL: 2.4786%
START WEIGHT: 3.1593g
START WT TARGET: 4.0g +/- 1.0g
END WEIGHT: 0.0783g
TEST DURATION: 95:25
START TEMP: 270C
TEST TEMP: 570C
HI START TEMP: 25C
TEMP RATE: 0C/Minute
PAN TARE: Standard
SAMPLE TARE: Start After 8s
END RATE: 0.0956%/Minute
RATE TARGET: 0.1000%/Minute
END RELIABILITY: 0.0%
RELIABILITY TARGET: 90%
CORRELATION CONSTANT: 0.0000% Moisture
ASHING RATE: 7.0%/Minute
LINKED TO NEXT TEST: No
LINK-RESULT TYPE: Individual
LINK-USE FOR TOTAL: No