

Sample: FULL- N2@77K- ADS/DES

Operator:

Submitter:

File: D:\OneDrive - Zachodniopomorski Uniwersytet Technologiczny w
Szczecinie\Doktorat\BET\...\Gd_FULL.SMP

Started:	18.11.2022 14:39:39	Analysis adsorptive:	N2
Completed:	21.11.2022 18:42:54	Analysis bath temp.:	77,300 K
Report time:	22.11.2022 14:25:26	Thermal correction:	Yes
Sample mass:	0,7532 g	Ambient free space:	28,0000 cm ³ Entered
Analysis free space:	83,0000 cm ³	Equilibration interval:	30 s
Low pressure dose:	0,00045 mmol/g	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Summary Report

Surface Area

BET Surface Area: 0,1666 m²/g

DFT Pore Size

Volume in Pores	<	9,87 Å	0,00005 cm ³ /g
Total Volume in Pores	<=	16,30 Å	0,00007 cm ³ /g
Area in Pores	>	16,30 Å	0,000 m ² /g
Total Area in Pores	>=	9,87 Å	0,055 m ² /g

Horvath-Kawazoe

Maximum pore volume at $p/p^\circ = 0,000232485$: 0,000079 cm³/g

Median pore width: 7,551 Å

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Automatic degas:	No		

Isotherm Tabular Report

Relative Pressure (p/p°)	Absolute Pressure (kPa)	Quantity Adsorbed (mmol/g)	Elapsed Time (h:min)	Saturation Pressure (kPa)
			04:58	101.6251621
0.000032546	0.0033116	0.00142	07:05	101.7508924
0.000073196	0.0074471	0.00178	09:09	101.7426818
0.000115643	0.0117626	0.00201	11:03	101.7144126
0.000161035	0.0163640	0.00216	13:53	101.6175049
0.000180005	0.0182645	0.00219	15:54	101.4667116
0.000188278	0.0190789	0.00216	17:57	101.3337472
0.000232485	0.0235351	0.00227	20:11	101.2328034
0.009984876	1.0135524	0.00173	68:44	101.5087654
0.071645694	7.2735236	-0.02404	68:50	101.5207355
0.129132984	13.1090639	-0.04986	68:55	101.5159995
0.182029379	18.4798586	-0.07429	69:00	101.5212970
0.231786525	23.5296541	-0.09774	69:06	101.5143314
0.281568424	28.5823688	-0.12148	69:11	101.5112717
0.331786292	33.6848515	-0.14550	69:16	101.5257481
0.381807517	38.7635610	-0.16973	69:22	101.5264479
0.432481530	43.9096966	-0.19449	69:28	101.5296459
0.481706083	48.8984599	-0.21841	69:33	101.5109869
0.531580017	53.9675795	-0.24284	69:38	101.5229651
0.581560606	59.0379523	-0.26739	69:44	101.5164227
0.631471073	64.1067912	-0.29203	69:49	101.5197590
0.681381855	69.1741043	-0.31659	69:54	101.5203205
0.731520806	74.2600479	-0.34139	70:00	101.5146081
0.781098298	79.3019196	-0.36519	70:05	101.5261712
0.831179845	84.3735414	-0.38852	70:10	101.5105719
0.881282160	89.4258371	-0.41101	70:16	101.4724240
0.930148610	94.4165492	-0.43033	70:21	101.5069508
0.978443442	99.3107767	-0.43648	70:28	101.4987402
0.998031230	101.2954366	-0.30635	70:38	101.4952574
0.891318284	90.4575070	-0.41857	70:45	101.4873235
0.770482743	78.1821058	-0.36445	70:50	101.4715859
0.670817424	68.0783405	-0.31695	70:56	101.4856472
0.570514447	57.9022869	-0.26795	71:01	101.4913596
0.470393797	47.7420850	-0.21869	71:07	101.4938659
0.370398230	37.5953666	-0.16973	71:12	101.4998550
0.270241598	27.4229342	-0.12075	71:17	101.4756220
0.170194545	17.2721859	-0.07254	71:23	101.4849555
0.128149316	13.0047990	-0.05272	71:28	101.4816111

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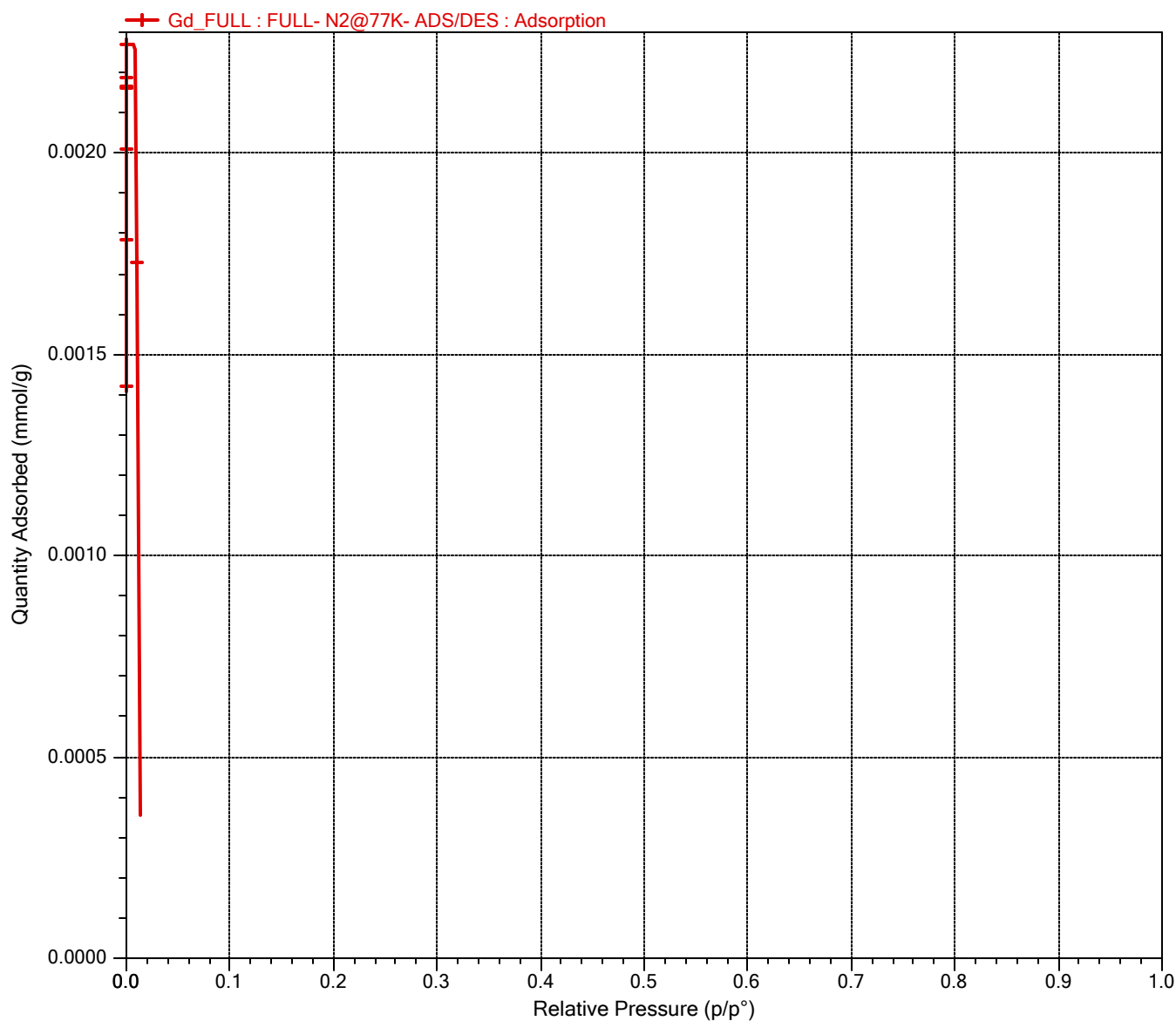
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 Analysis free space: 83,0000 cm³
 Low pressure dose: 0,00045 mmol/g
 Automatic degas: No

Analysis adsorptive: N2
 Analysis bath temp.: 77,300 K
 Thermal correction: Yes
 Ambient free space: 28,0000 cm³ Entered
 Equilibration interval: 30 s
 Sample density: 1,000 g/cm³

Isotherm Linear Plot



Sample: FULL- N2@77K- ADS/DES

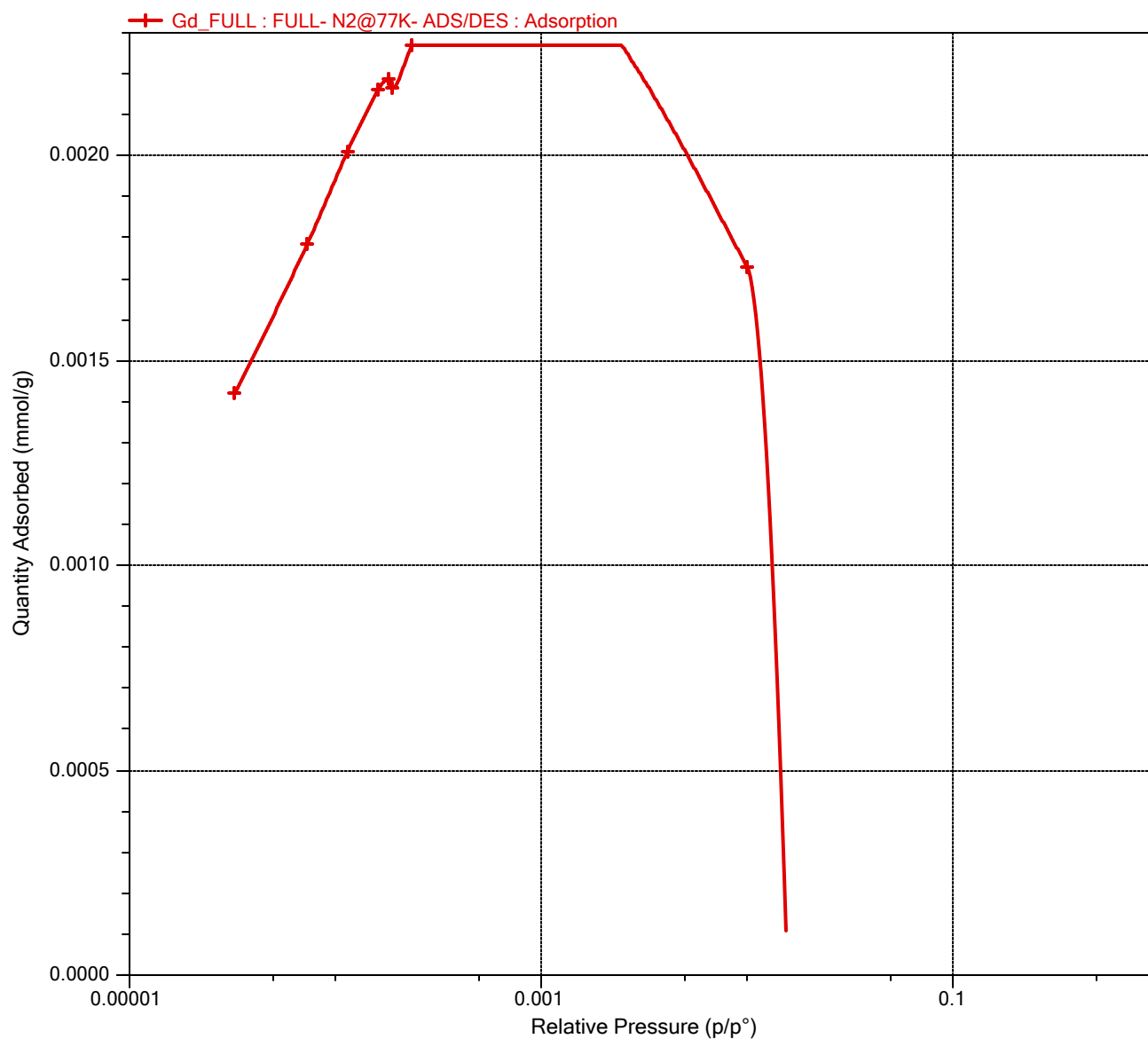
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Automatic degas:	No		

Isotherm Log Plot



Sample: FULL- N2@77K- ADS/DES

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Automatic degas:	No		

BET Report

BET surface area: 0,1666 ± 0,0004 m²/g
 Slope: 585,66217 ± 1,44073 g/mmol
 Y-intercept: -0,01534 ± 0,00509 g/mmol
 C: -38 182,028747
 Qm: 0,00171 mmol/g
 Correlation coefficient: 0,9999818
 Molecular cross-sectional area: 0,1620 nm²

Relative Pressure (p/p°)	Quantity Adsorbed (mmol/g)	1/[Q(p°/p - 1)]
0.000032546	0.00142	0.02294
0.000073196	0.00178	0.04106
0.000115643	0.00201	0.05749
0.000161035	0.00216	0.07456
0.000180005	0.00219	0.08230
0.000188278	0.00216	0.08701
0.000232485	0.00227	0.10252
0.009984876	0.00173	5.83299

Sample: FULL- N2@77K- ADS/DES

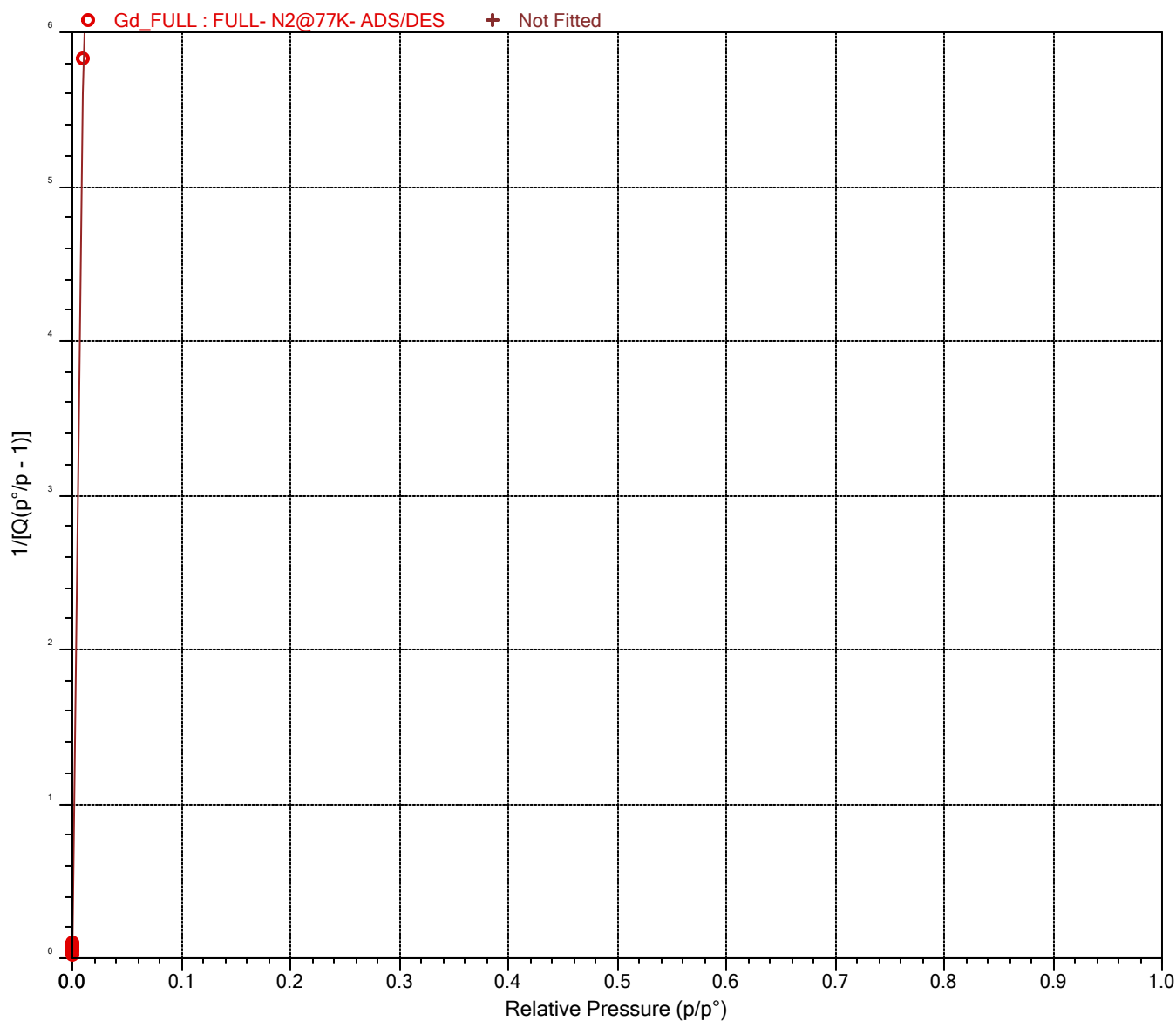
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Automatic degas:	No		

BET Surface Area Plot



Sample: FULL- N2@77K- ADS/DES

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Automatic degas:	No		

t-Plot Reports

Primary Data

4053- At least two data points must be selected for t-Plot calculations.

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Automatic degas:	No		

Horvath-Kawazoe Report

Cylinder Pore Geometry (Saito-Foley)

Maximum pore volume: 0,000079 cm³/g
 at Relative Pressure: 0,000232485
 Median pore width: 7,551 Å
 Relative pressure range: 1e-09 to 0.18

Diameter of adsorptive molecule: 3,000 Å
 Adsorptive density: 6.710e+14 molecules/cm²
 Adsorptive dispersion constant: 7.777e-59
 Diameter of sample atom: 3,400 Å
 Sample Density: 3.845e+15 molecules/cm²
 Sample dispersion constant: 6.036e-59

Density conversion factor: 0,0015468

Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Adsorbed (mmol/g)	Pore Width (Å)	Cumulative Pore Volume (cm ³ /g)	Smoothed Differential Pore Volume (cm ³ /g·Å)
0.00331	0.000032546	0.00142	7.551	0.0000	0.0000
0.00745	0.000073196	0.00178	8.007	0.0001	0.0000
0.01176	0.000115643	0.00201	8.297	0.0001	0.0000
0.01636	0.000161035	0.00216	8.524	0.0001	0.0000
0.01826	0.000180005	0.00219	8.604	0.0001	0.0000
0.01908	0.000188278	0.00216	8.638	0.0001	0.0000
0.02354	0.000232485	0.00227	8.795	0.0001	0.0000
1.01355	0.009984876	0.00173	13.795	0.0001	-0.0000

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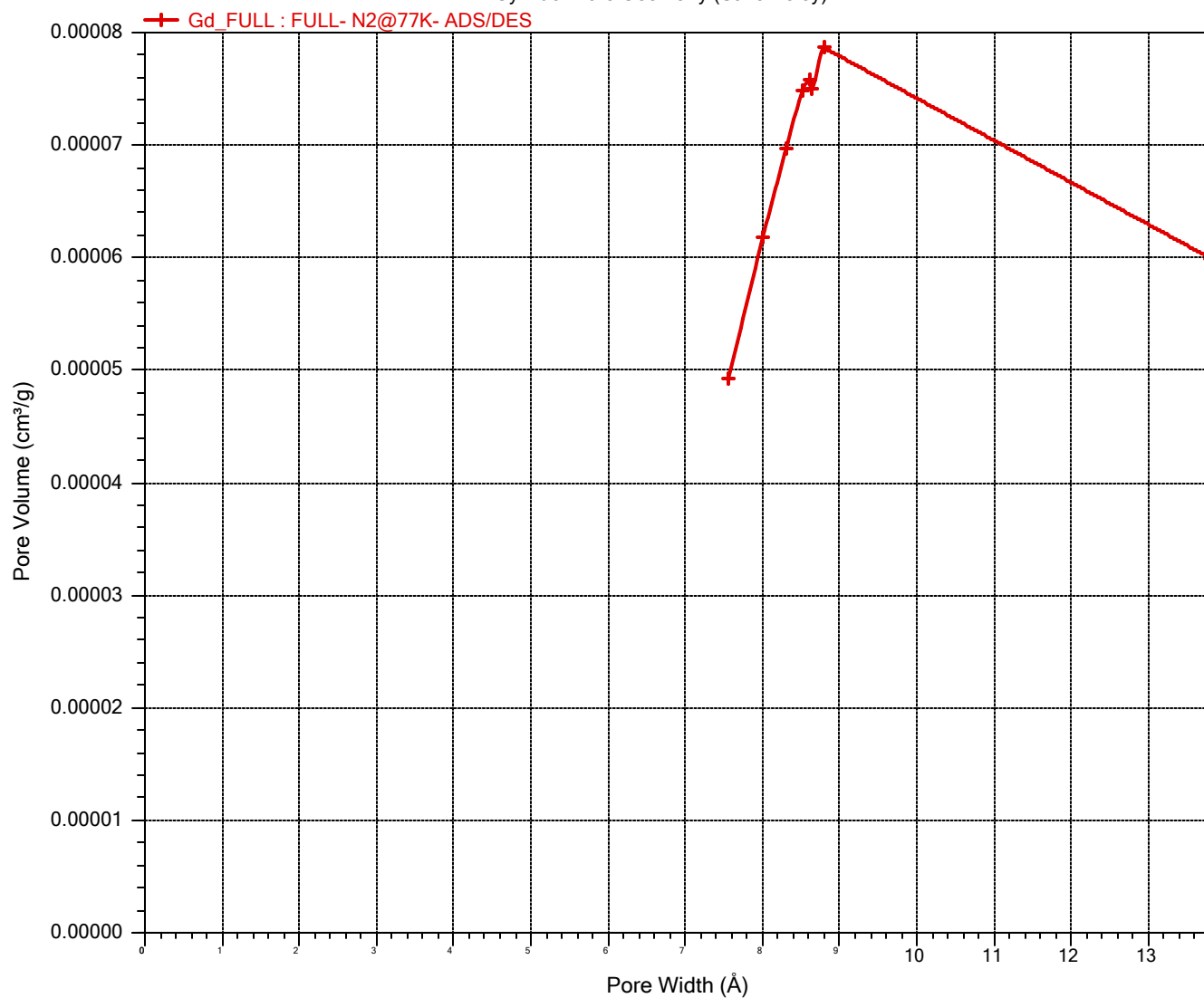
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Sample density: 1,000 g/cm³

Horvath-Kawazoe Cumulative Pore Volume Plot

Cylinder Pore Geometry (Saito-Foley)



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Operator:

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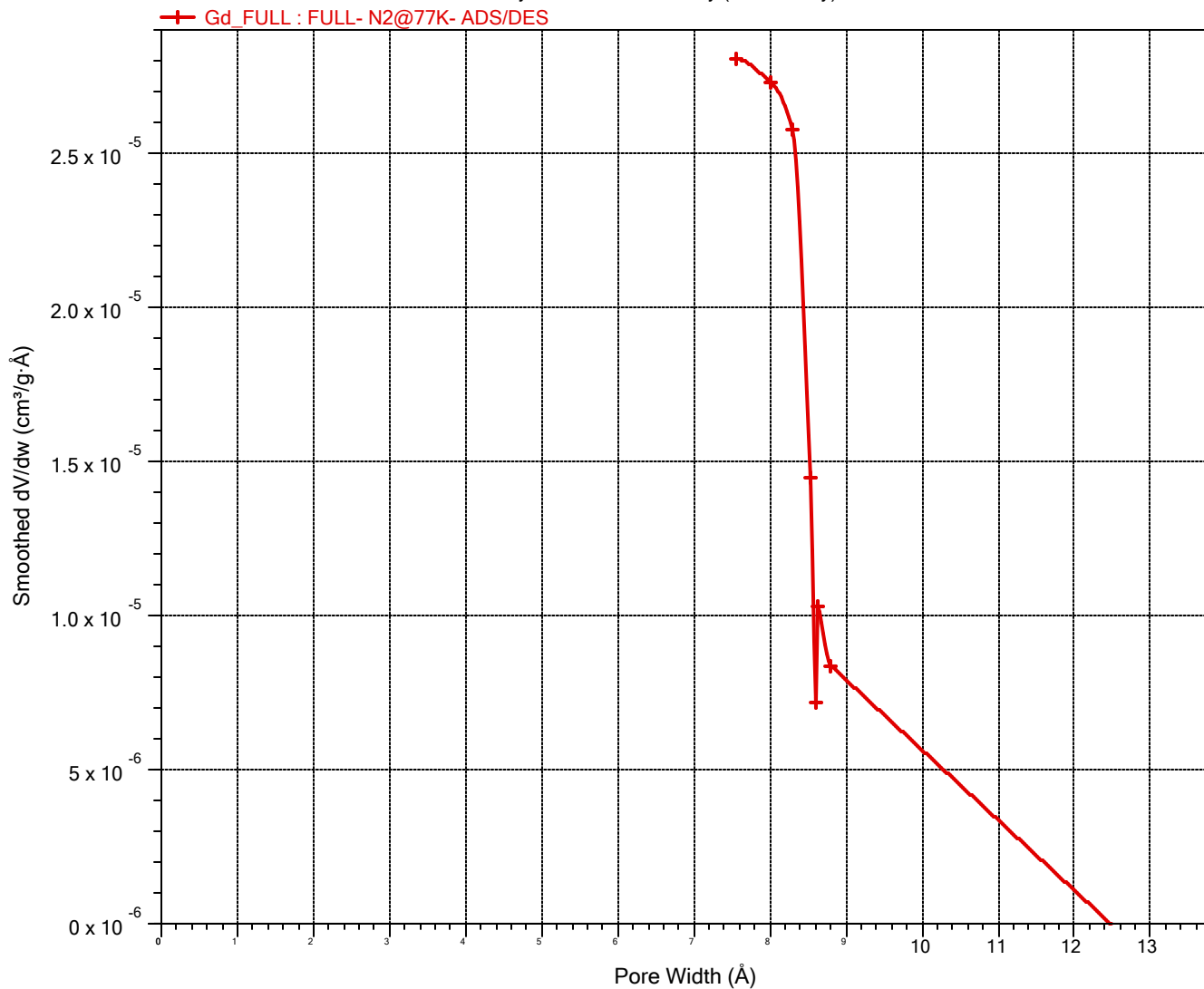
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Automatic degas: No

Analysis adsorptive: N2
Analysis bath temp.: 77,300 K
Thermal correction: Yes
Ambient free space: 28,0000 cm³ Entered
Equilibration interval: 30 s
Sample density: 1,000 g/cm³

Horvath-Kawazoe Differential Pore Volume Plot

Cylinder Pore Geometry (Saito-Foley)



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Low pressure dose:	0,00045 mmol/g	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Porosity Distribution by
Model: N2 - Cylindrical Pores - Oxide Surface
Method: Non-negative Regularization: 0,01000
Standard Deviation of Fit: 0,000178 mmol/g

Volume in Pores	<	9,87 Å	0,00005 cm ³ /g
Total Volume in Pores	<=	16,30 Å	0,00007 cm ³ /g
Area in Pores	>	16,30 Å	0,000 m ² /g
Total Area in Pores	>=	9,87 Å	0,055 m ² /g

Pore Table				
Pore Width (Å)	Cumulative Pore Volume (cm ³ /g)	Incremental Pore Volume (cm ³ /g)	Cumulative Pore Area (m ² /g)	Incremental Pore Area (m ² /g)
9.87	0.00005	0.00000	0.000	0.000
10.22	0.00005	0.00000	0.000	0.000
10.58	0.00005	0.00000	0.000	0.000
10.94	0.00005	0.00000	0.000	0.000
11.30	0.00007	0.00002	0.055	0.055
11.65	0.00007	0.00000	0.055	0.000
12.01	0.00007	0.00000	0.055	0.000
12.37	0.00007	0.00000	0.055	0.000
12.73	0.00007	0.00000	0.055	0.000
13.08	0.00007	0.00000	0.055	0.000
13.44	0.00007	0.00000	0.055	0.000
13.80	0.00007	0.00000	0.055	0.000
14.16	0.00007	0.00000	0.055	0.000
14.51	0.00007	0.00000	0.055	0.000
14.87	0.00007	0.00000	0.055	0.000
15.23	0.00007	0.00000	0.055	0.000
15.59	0.00007	0.00000	0.055	0.000
15.94	0.00007	0.00000	0.055	0.000
16.30	0.00007	0.00000	0.055	0.000

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Automatic degas:	No		

Porosity Distribution by
Model: N2 - Cylindrical Pores - Oxide Surface
Method: Non-negative Regularization: 0,01000
Standard Deviation of Fit: 0,000178 mmol/g

Isotherm Table				
Relative Pressure (p/p°)	Experimental Quantity Adsorbed (mmol/g)	Fitted Quantity Adsorbed (mmol/g)	Absolute Residual (mmol/g)	Relative Residual
0.000039811	0.00149	0.00182	-0.00032	-0.217057
0.000050119	0.00160	0.00183	-0.00024	-0.147376
0.000063096	0.00171	0.00184	-0.00013	-0.078747
0.000079433	0.00182	0.00187	-0.00005	-0.025592
0.000100000	0.00194	0.00192	0.00002	0.011866
0.000125892	0.00205	0.00194	0.00011	0.052383
0.000158490	0.00215	0.00196	0.00019	0.088495
0.000199526	0.00218	0.00198	0.00020	0.093501
0.000251188	0.00227	0.00200	0.00027	0.119230
0.000316228	0.00226	0.00202	0.00025	0.108482
0.000398107	0.00226	0.00207	0.00019	0.084163
0.000501187	0.00225	0.00210	0.00015	0.067037
0.000630958	0.00225	0.00212	0.00013	0.056320
0.000794328	0.00224	0.00213	0.00010	0.046764
0.001000000	0.00223	0.00214	0.00008	0.037149
0.001258925	0.00221	0.00215	0.00006	0.026793
0.001584895	0.00219	0.00216	0.00003	0.015100
0.001995263	0.00217	0.00217	0.00000	0.001420
0.002511882	0.00214	0.00217	-0.00003	-0.015046
0.003162276	0.00211	0.00218	-0.00007	-0.035351
0.003981066	0.00206	0.00219	-0.00013	-0.060936
0.005011868	0.00200	0.00219	-0.00019	-0.093859
0.006309579	0.00193	0.00220	-0.00027	-0.137174
0.007943276	0.00184	0.00220	-0.00036	-0.195625

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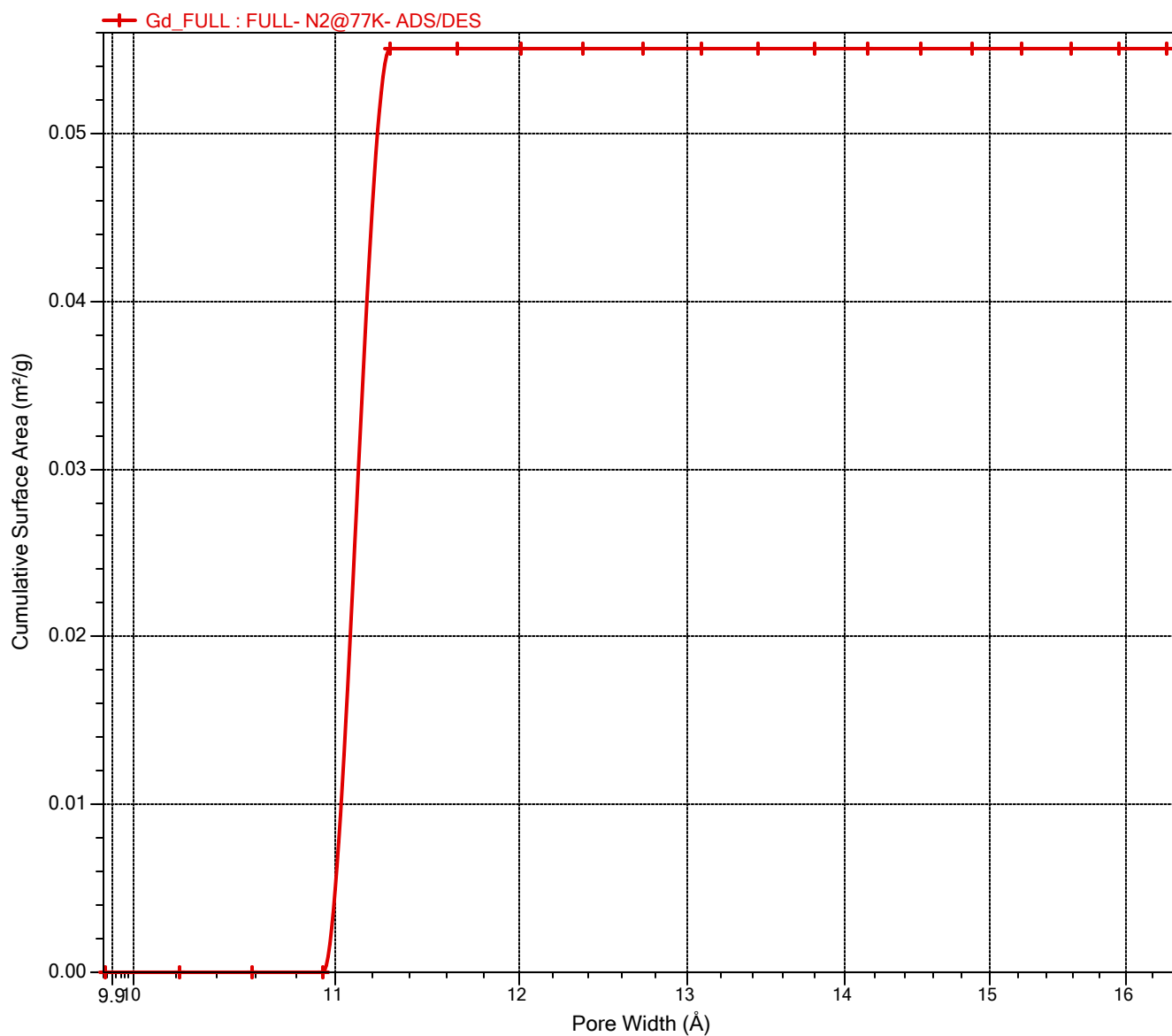
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Automatic degas: No

Analysis adsorptive: N2
Analysis bath temp.: 77,300 K
Thermal correction: Yes
Ambient free space: 28,0000 cm³ Entered
Equilibration interval: 30 s
Sample density: 1,000 g/cm³

Cumulative Surface Area vs. Pore Width



Sample: FULL- N2@77K- ADS/DES

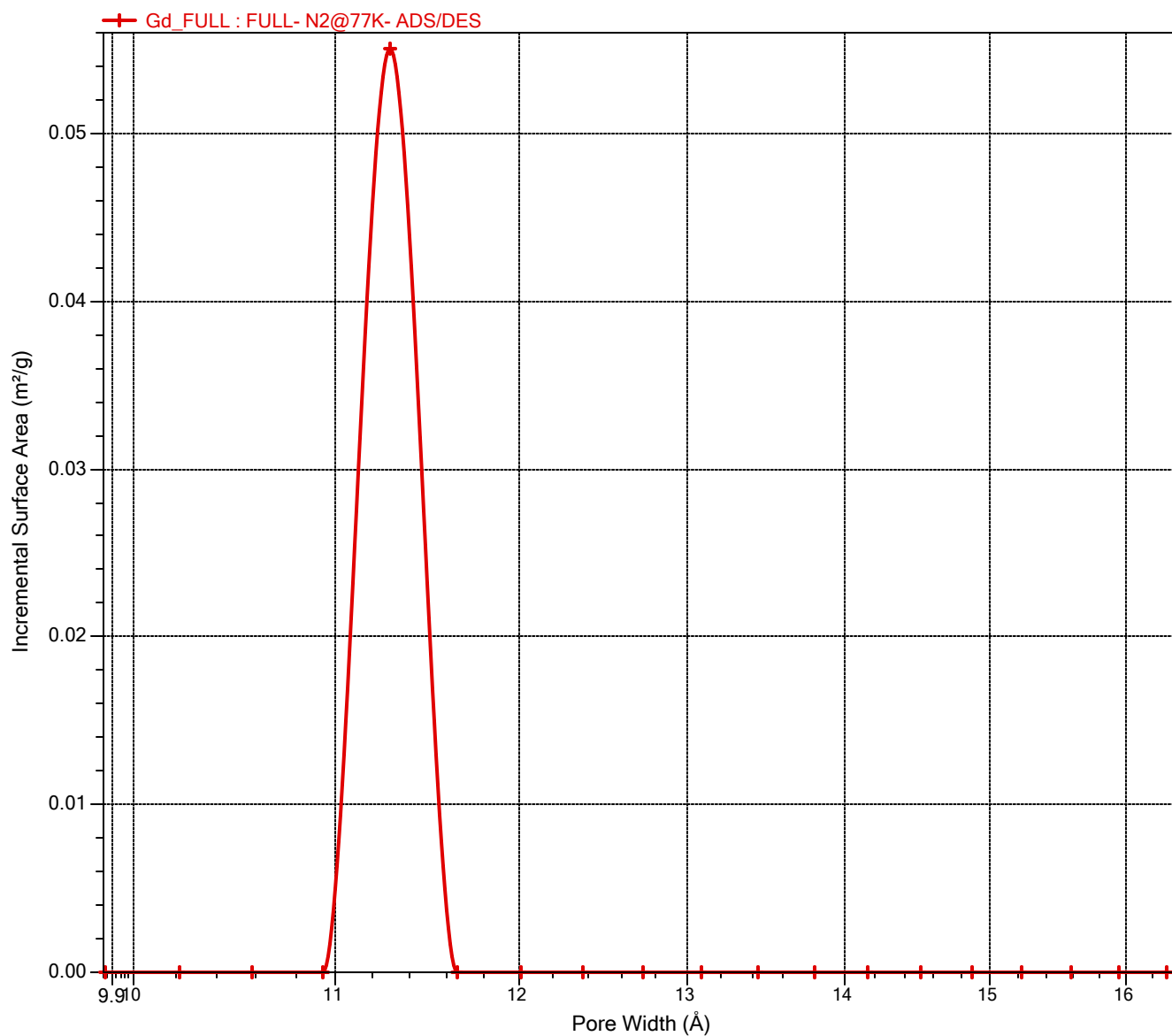
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Low pressure dose:	0,00045 mmol/g	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Incremental Surface Area vs. Pore Width



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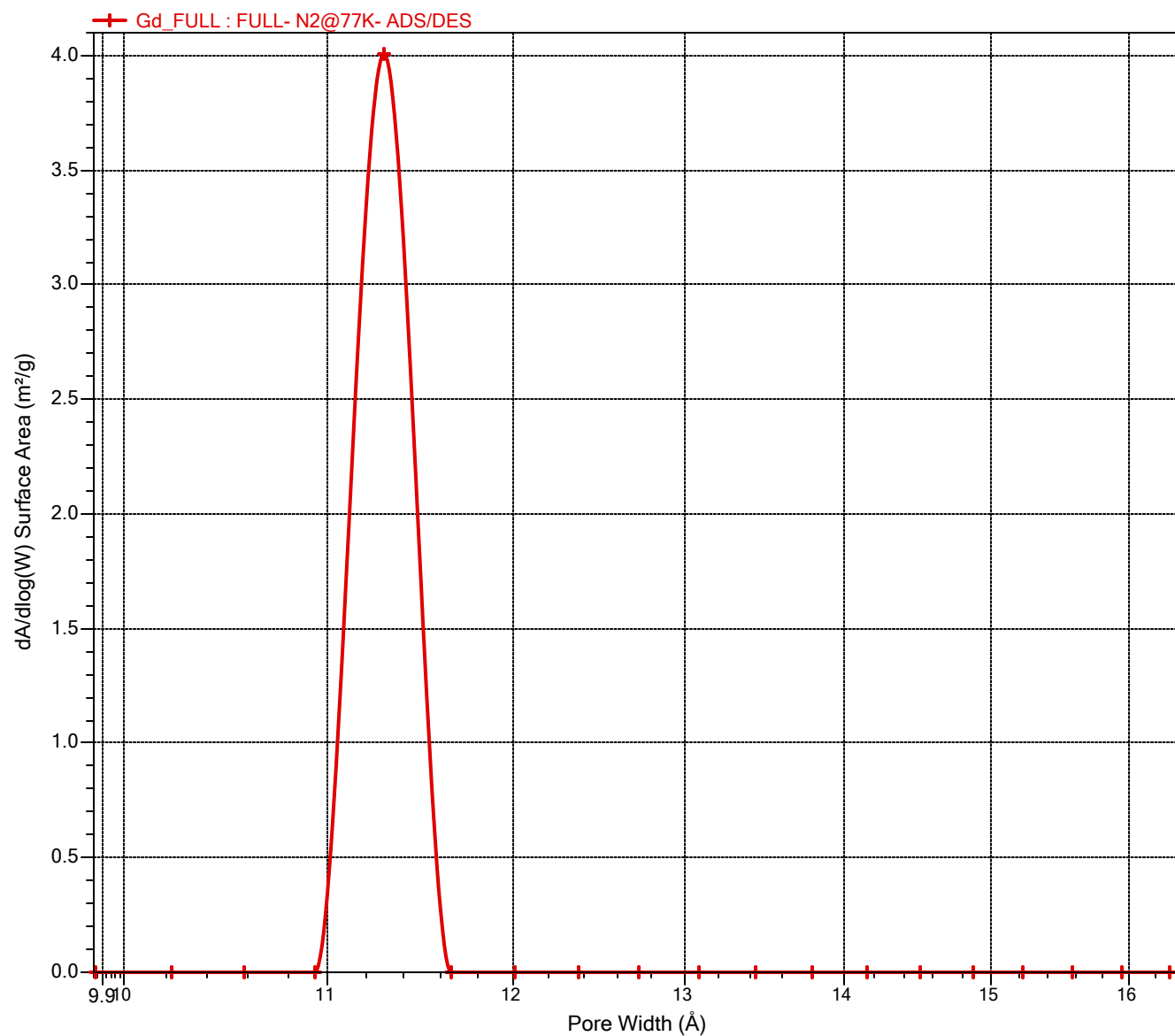
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Automatic degas:	No		

dA/dlog(W) Surface Area vs. Pore Width



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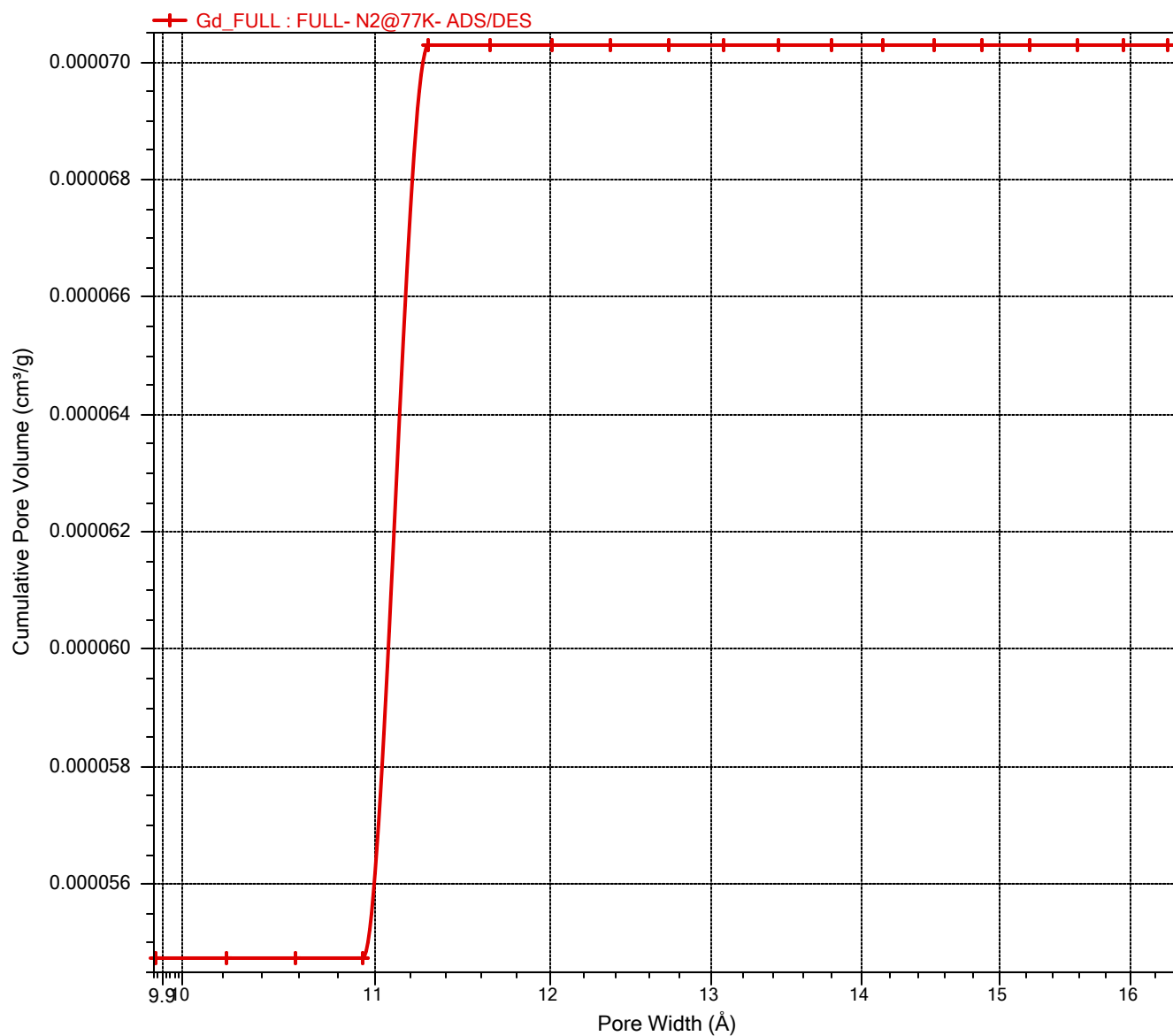
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Sample density: 1,000 g/cm³

Cumulative Pore Volume vs. Pore Width



Sample: FULL- N2@77K- ADS/DES

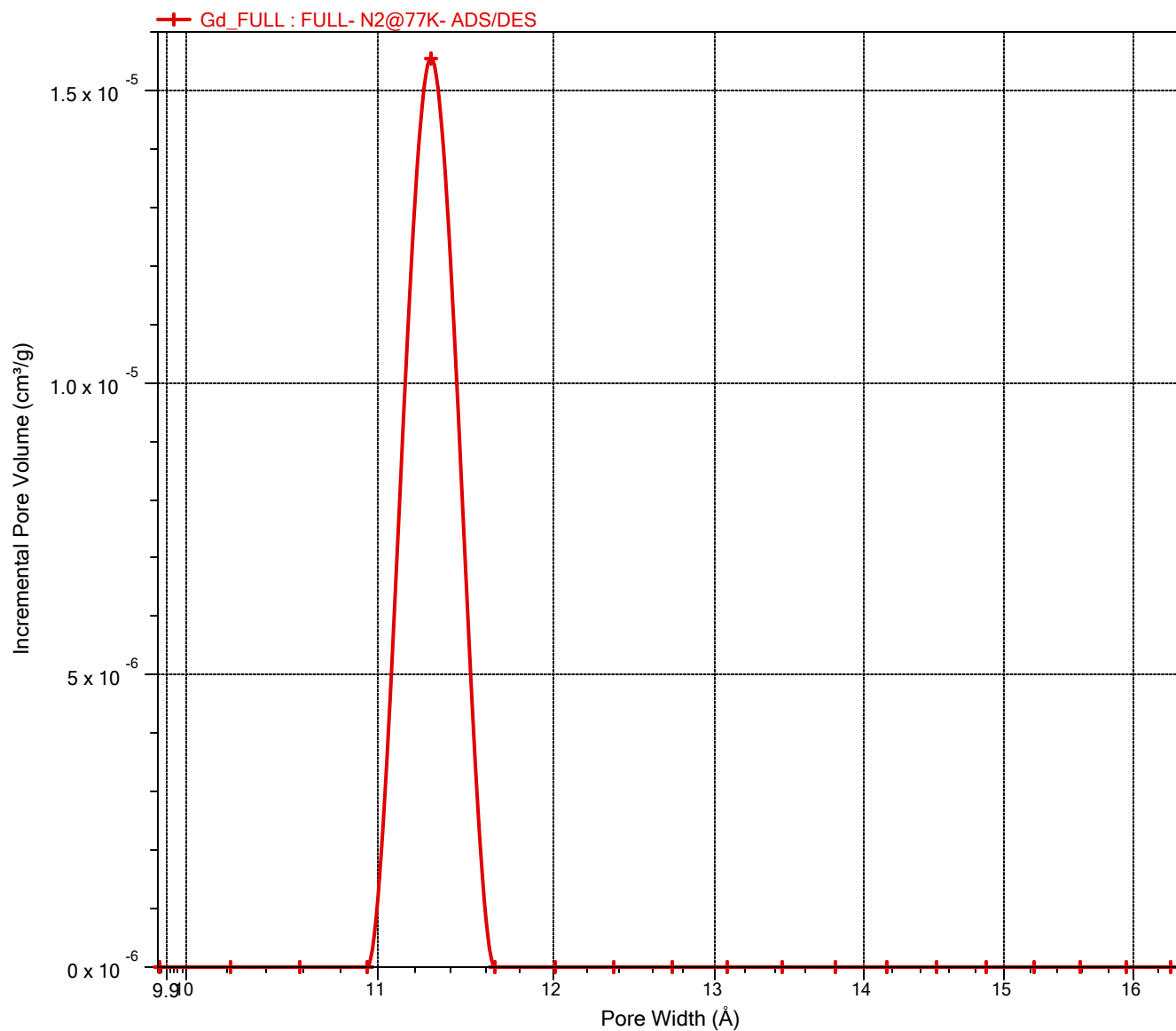
Operator:

Submitter:

File: D:\OneDrive - Zachodniopomorski Uniwersytet Technologiczny w
Szczecinie\Doktorat\BET\...\Gd_FULL.SMP

Started:	18.11.2022 14:39:39	Analysis adsorptive:	N2
Completed:	21.11.2022 18:42:54	Analysis bath temp.:	77,300 K
Report time:	22.11.2022 14:25:26	Thermal correction:	Yes
Sample mass:	0,7532 g	Ambient free space:	28,0000 cm ³ Entered
Analysis free space:	83,0000 cm ³	Equilibration interval:	30 s
Low pressure dose:	0,00045 mmol/g	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Incremental Pore Volume vs. Pore Width



Sample: FULL- N2@77K- ADS/DES

Operator:

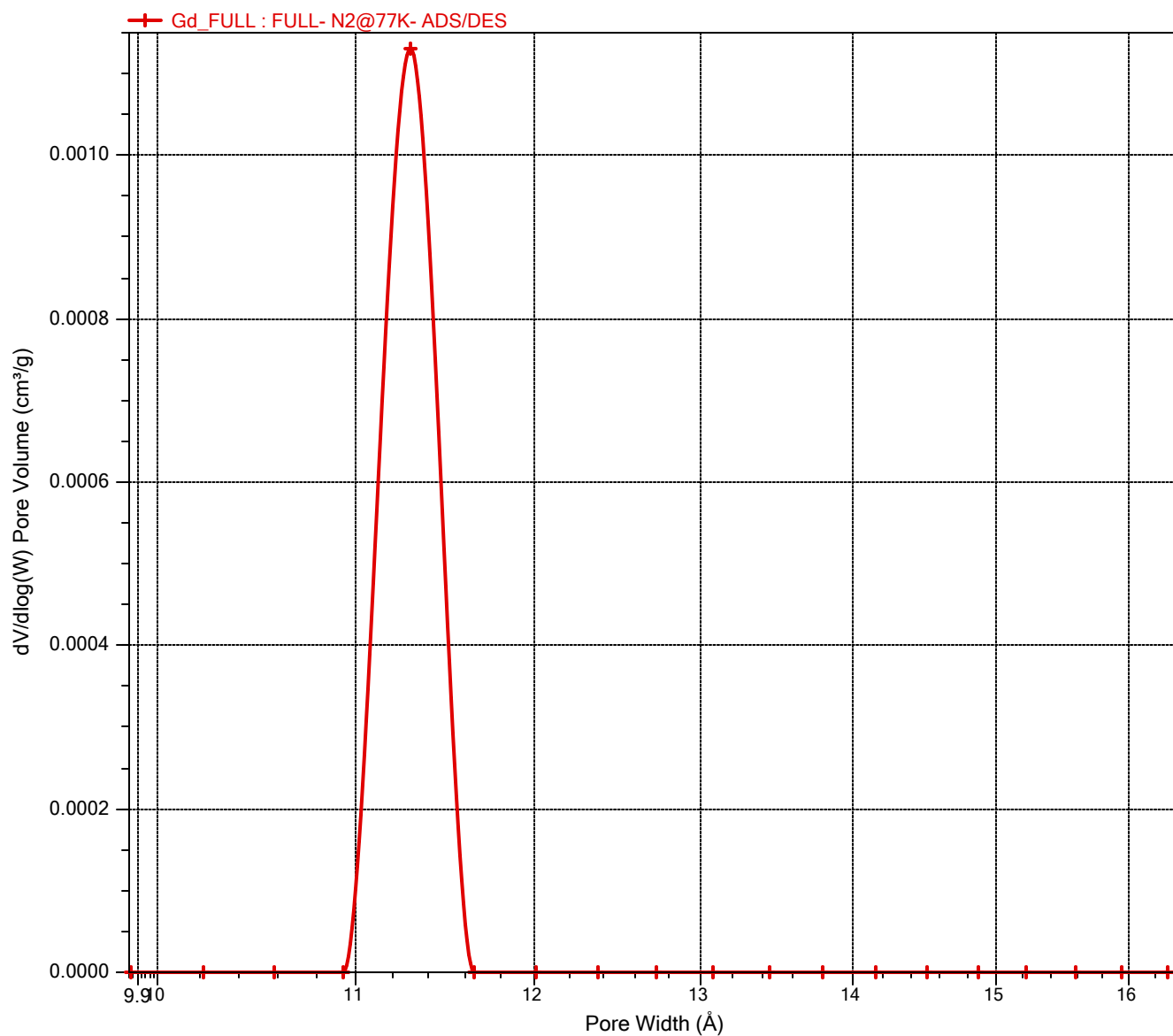
Submitter:

File: D:\OneDrive - Zachodniopomorski Uniwersytet Technologiczny w
Szczecinie\Doktorat\BET\...\Gd_FULL.SMP

Started: 18.11.2022 14:39:39
Completed: 21.11.2022 18:42:54
Report time: 22.11.2022 14:25:26
Sample mass: 0,7532 g
Analysis free space: 83,0000 cm³
Low pressure dose: 0,00045 mmol/g
Automatic degas: No

Analysis adsorptive: N2
Analysis bath temp.: 77,300 K
Thermal correction: Yes
Ambient free space: 28,0000 cm³ Entered
Equilibration interval: 30 s
Sample density: 1,000 g/cm³

dV/dlog(W) Pore Volume vs. Pore Width



Sample: FULL- N2@77K- ADS/DES

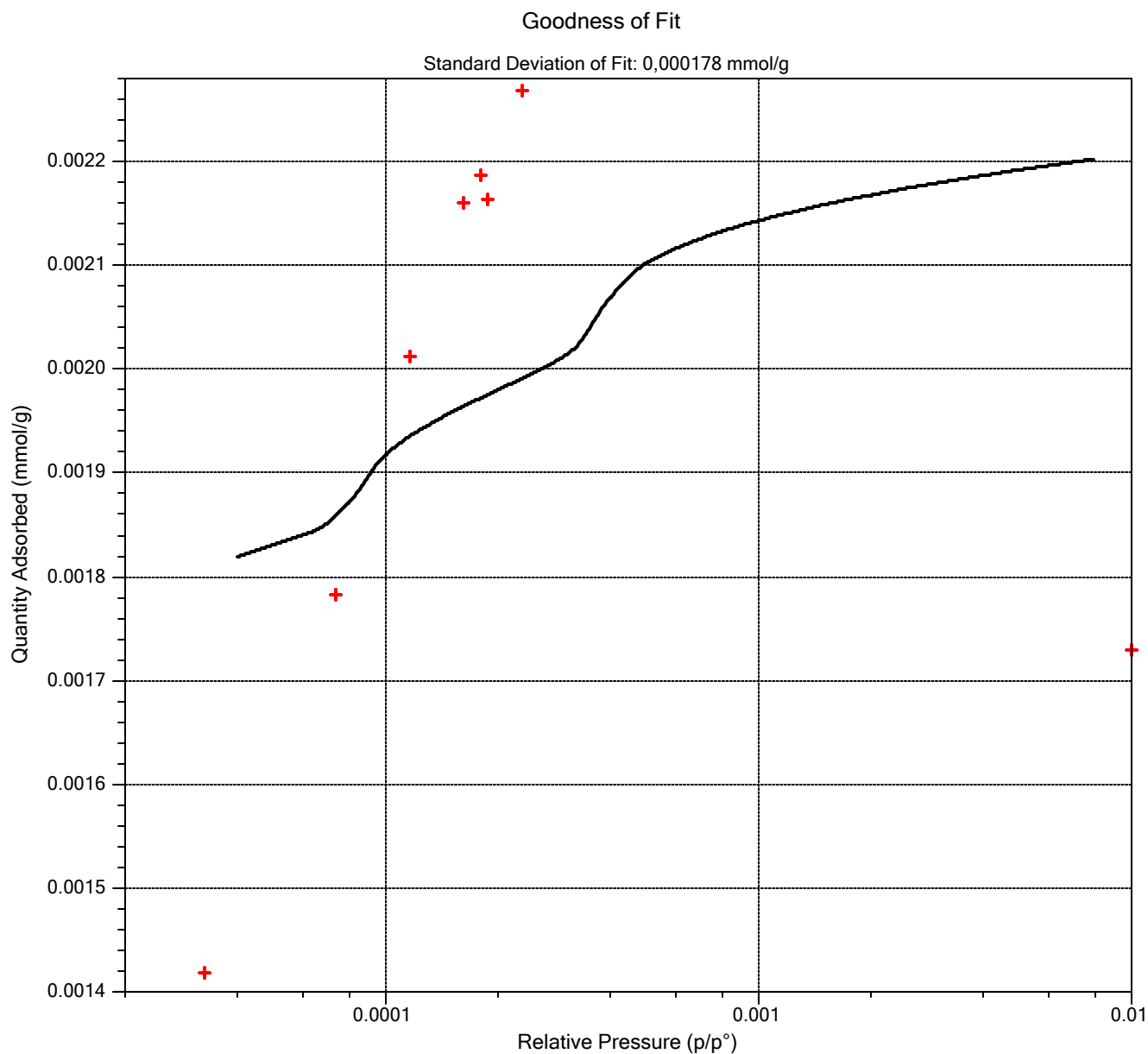
Operator:

Submitter:

File: D:\OneDrive - Zachodniopomorski Uniwersytet Technologiczny w
Szczecinie\Doktorat\BET\...\Gd_FULL.SMP

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Low pressure dose: 0,00045 mmol/g
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Analysis adsorptive: N2
Analysis bath temp.: 77,300 K
Thermal correction: Yes
Ambient free space: 28,0000 cm³ Entered
Equilibration interval: 30 s
Sample density: 1,000 g/cm³



Sample: FULL- N2@77K- ADS/DES

Operator:

Submitter:

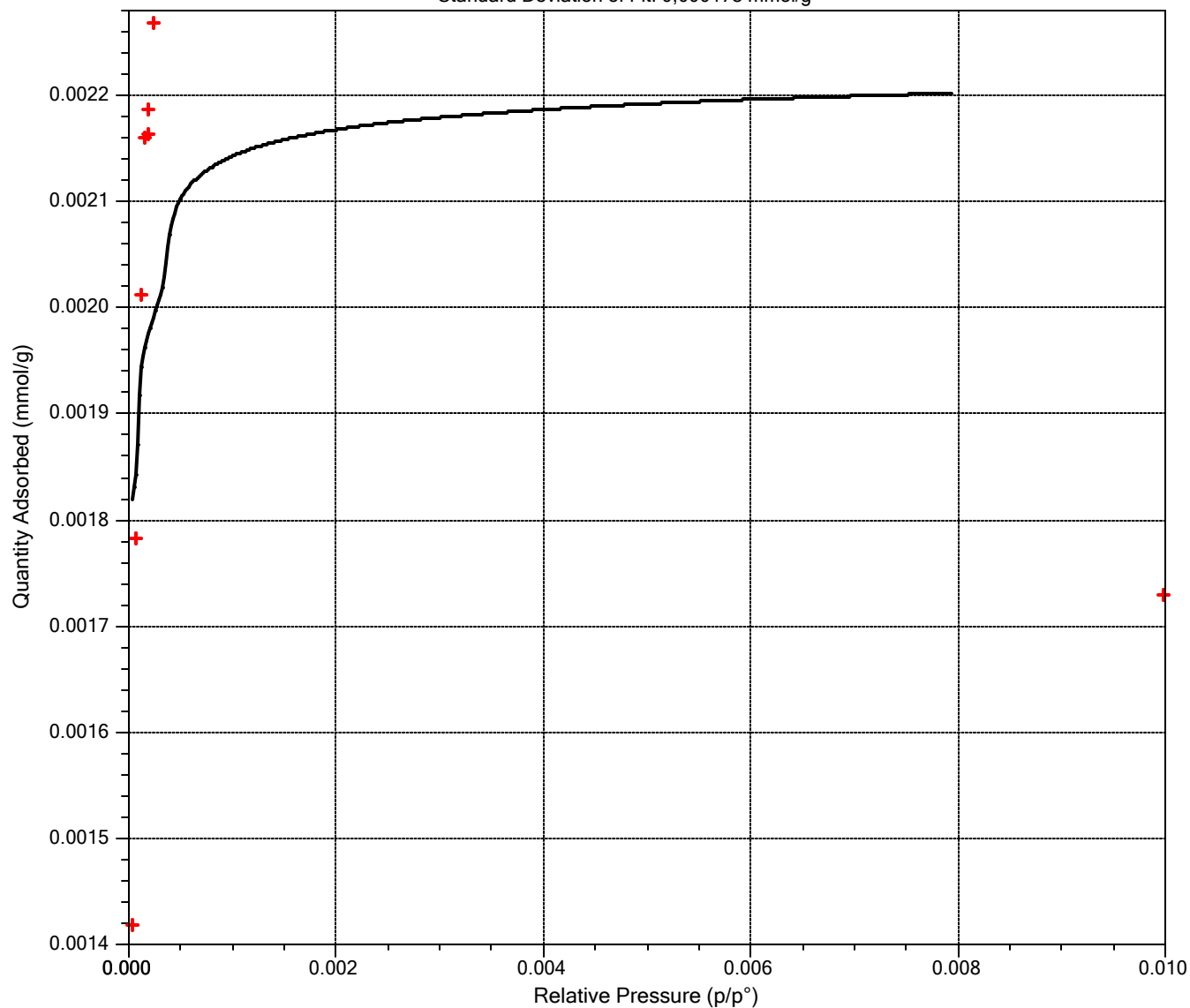
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Automatic degas: No

Analysis adsorptive: N2
Analysis bath temp.: 77,300 K
Thermal correction: Yes
Ambient free space: 28,0000 cm³ Entered
Equilibration interval: 30 s
Sample density: 1,000 g/cm³

Goodness of Fit

Standard Deviation of Fit: 0,000178 mmol/g



Sample: FULL- N2@77K- ADS/DES
 Operator:
 Submitter:
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Automatic degas:	No		

Sample Information

Method: FULL- N2@77K- ADS/DES
 Sample: FULL- N2@77K- ADS/DES
 Operator:
 Submitter:
 Mass type: Entered
 Sample mass: 0,7532 g
 Density: 1,000 g/cm³
 Type of data: Automatically collected
 Instrument type: 2460
 Original instrument type: 2460
 Comments:

Sample Tube

Sample tube: W1
 Ambient free space: 1,0000 cm³
 Analysis free space: 1,0000 cm³
 Non-ideality factor: 0,0000620
 Use isothermal jacket: Yes
 Use filler rod: No
 Vacuum seal type: None

Degas Conditions

Degas conditions: FULL- N2@77K- ADS/DES

Smart VacPrep evacuation
 Backfill sample tube: Automatic
 Evacuation rate: 0,27 kPa/s
 Unrest. evacuation from: 0,27 kPa
 Vacuum level: 7e-02 kPa
 Evacuation time: 60 min
 Temperature ramp rate: 10,0 K/min
 Target temperature: 363 K
 Hold pressure: 13,3 kPa

Heating Phase

Sample prep: Stage	Temperature (K)	Ramp Rate (K/min)	Time (min)
1	523	10,0	720

Analysis Conditions

Sample: FULL- N2@77K- ADS/DES

Operator:

Submitter:

File: D:\OneDrive - Zachodniopomorski Uniwersytet Technologiczny w
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Automatic degas:	No		

Analysis conditions: FULL- N2@77K- ADS/DES
 Isotherm collection: Target Pressure
 Absolute pressure dosing: No

Pressure Table		
Starting Pressure (p/p°)	Pressure Increment (p/p°)	Ending Pressure (p/p°)
0,000000000		0,010000000
0,010000000	0,050000000	0,995000000
0,995000000	0,100000000	0,150000000

Preparation

Fast evacuation: No
 Evacuation rate: 0,27 kPa/s
 Unrestricted evacuation from: 0,27 kPa
 Vacuum setpoint: 1,3 Pa
 Evacuation time: 4,00 h

Leak test: No
 Use TranSeal: No

Free Space

Entered

Ambient free space: 28,0000 cm³
 Analysis free space: 83,0000 cm³

p° and Temperature

p° type: Measured in Psat tube for each point
 Temperature type: Entered
 Temperature: 77,300 K

Dosing

Use first pressure fixed dose: No
 Use maximum volume increment: No
 Target tolerance: 5.0% or 0,6666 kPa
 Low pressure dosing: Yes
 Dose amount: 0,00045 mmol/g
 Minimum equilibration delay: 0,50 h
 Maximum equilibration delay: 2,00 h
 Maximum number of decants: 6

Sample: FULL- N2@77K- ADS/DES

Operator:

Submitter:

File: D:\OneDrive - Zachodniopomorski Uniwersytet Technologiczny w
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Low pressure dose:	0,00045 mmol/g	Sample density:	1,000 g/cm ³
Automatic degas:	No		

	Equilibration Relative Pressure (p/p°)	Equilibration Interval (s)
1	1,000000000	30

Minimum equilibration delay at p/p° >= 0.995: 600 s

Sample Backfill

Backfill at start of analysis: Yes

Backfill at end of analysis: Yes

Backfill gas: N2

Adsorptive Properties

Adsorptive:	Nitrogen @ 77.35 K (N2)
Non-condensing adsorptive:	No
Maximum manifold pressure:	123,323 kPa
Therm. tran. hard-sphere diameter:	3,8600 Å
Molecular cross-sectional area:	0,162 nm ²
Adsorbate molecular weight:	28,01
Thermal conductivity:	1,00
Non-ideality factor:	0,0000620
Density conversion factor:	0,0015468
Dosing method:	Normal

Psat vs. Temperature Table

	Saturation Pressure (kPa)	Temperature (K)
1	80,0192	75,40
2	84,5947	75,85
3	89,9104	76,35
4	96,0481	76,90
5	98,9411	77,15
6	101,3028	77,35
7	103,7071	77,55
8	107,3945	77,85
9	113,7597	78,35
10	120,4064	78,85

Report Options

Inside diameter of sample tube: 9,53 mm

Sample: FULL- N2@77K- ADS/DES

Operator:

Submitter:

File: D:\OneDrive - Zachodniopomorski Uniwersytet Technologiczny w
Szczecinie\Doktorat\BET...\Gd_FULL.SMP

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Low pressure dose:	0,00045 mmol/g	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Sample Log

Date	Time	Log Message
18.11.2022	14:39:39	Starting a sample analysis for C:\ASAP 2460\data\2022\Kędzierski\Sikora\Gd_FULL.SMP on port 4.
18.11.2022	19:45:20	Low pressure data collection started
21.11.2022	11:17:39	Standard data collection started.
21.11.2022	18:19:28	Termination started.
21.11.2022	18:42:54	Finished a sample analysis for C:\ASAP 2460\data\2022\Kędzierski\Sikora\Gd_FULL.SMP on port 4.