

Sample: 1
Operator:
Submitter:
File: C:\Users\barto\OneDrive - Zachodniopomorski Uniwersytet Technologiczny w
Szcz...\\HF_HCl_1_3 full.SMP

Started:	14.03.2023 14:41:36	Analysis adsorptive:	N2
Completed:	15.03.2023 02:52:01	Analysis bath temp.:	77,300 K
Report time:	19.10.2023 09:08:12	Thermal correction:	Yes
Sample mass:	0,3771 g	Ambient free space:	28,3522 cm ³ Entered
Analysis free space:	84,0724 cm ³	Equilibration interval:	30 s
Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Summary Report

Surface Area

BET Surface Area: 0,7380 m²/gt-Plot Micropore Area: 2,8356 m²/gt-Plot external surface area: -2,0976 m²/g

DFT Pore Size

Volume in Pores	<	1,559 nm	0,00017 cm ³ /g
Total Volume in Pores	<=	3,525 nm	0,00017 cm ³ /g
Area in Pores	>	3,525 nm	0,000 m ² /g
Total Area in Pores	>=	1,559 nm	0,000 m ² /g

Horvath-Kawazoe

Maximum pore volume at p/p° = 0,068950039: 0,000262 cm³/g

Median pore width: 1,1989 nm

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Automatic degas:	No		

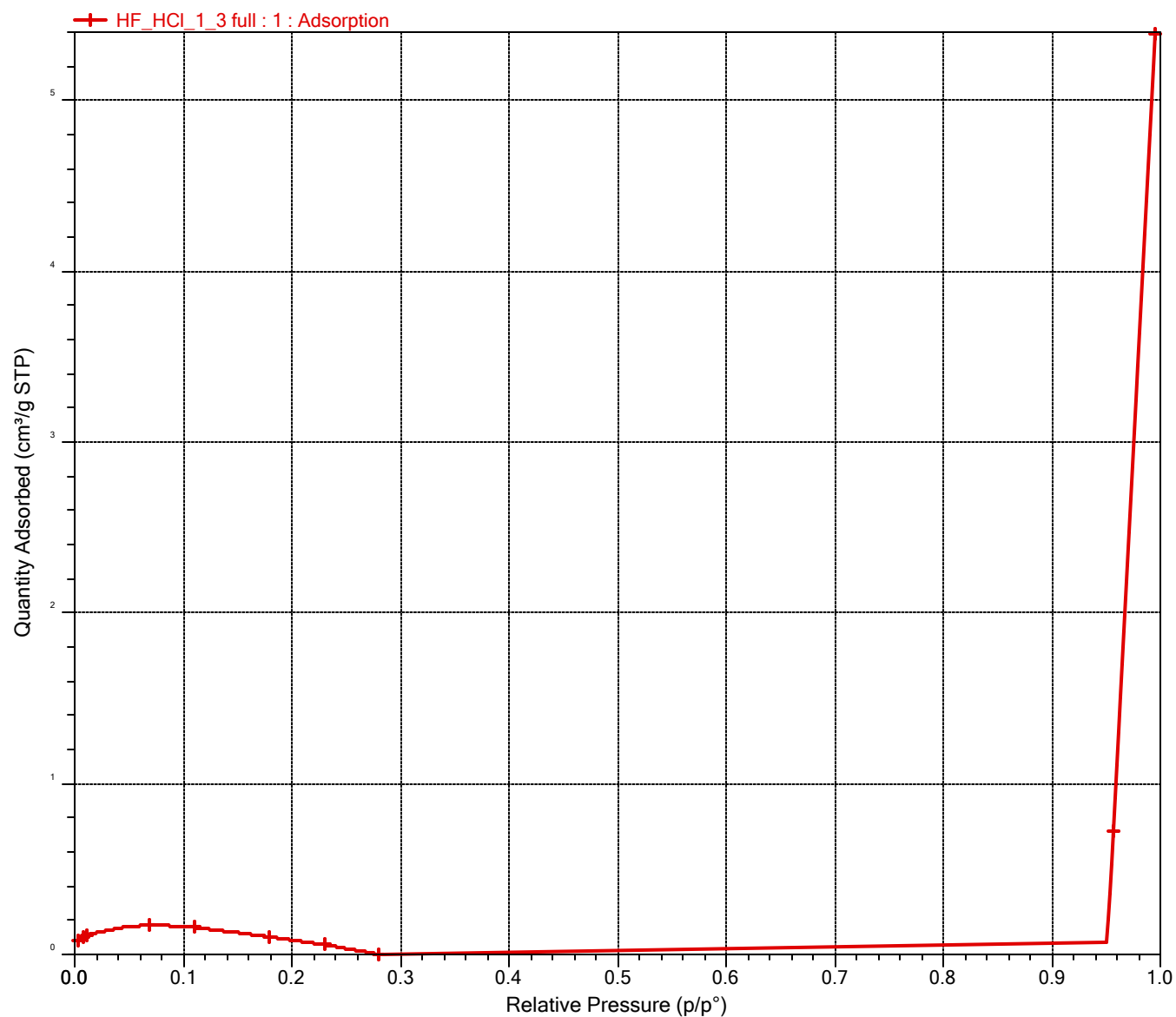
Isotherm Tabular Report

Relative Pressure (p/p°)	Absolute Pressure (kPa)	Quantity Adsorbed (cm ³ /g STP)	Elapsed Time (h:min)	Saturation Pressure (kPa)
			04:48	99.9707812
0.003994745	0.4001558	0.0772	05:30	100.1705370
0.008158349	0.8181777	0.1014	06:13	100.2871697
0.011922298	1.1990263	0.1126	08:48	100.5700648
0.068950039	6.9348042	0.1696	08:53	100.5772338
0.110187979	11.0824479	0.1578	08:59	100.5776488
0.179910098	18.0960502	0.1028	09:04	100.5838494
0.229782876	23.1148545	0.0563	09:09	100.5943303
0.279819579	28.1521591	0.0008	09:15	100.6082534
0.329761903	33.1811778	-0.0572	09:20	100.6216230
0.379767394	38.2132318	-0.1197	09:26	100.6227297
0.429696757	43.2417013	-0.1832	09:31	100.6330641
0.479630643	48.2711350	-0.2497	09:36	100.6423082
0.529536360	53.3034697	-0.3196	09:42	100.6606416
0.579626796	58.3410490	-0.3771	09:47	100.6527810
0.629496724	63.3637206	-0.4351	09:52	100.6577447
0.679342207	68.3942610	-0.4882	09:58	100.6771849
0.729281382	73.4322512	-0.5256	10:03	100.6912462
0.779253201	78.4647242	-0.5371	10:08	100.6922064
0.829066031	83.4864315	-0.5111	10:14	100.6993754
0.878730444	88.4958515	-0.3862	10:19	100.7087578
0.909681514	91.6182842	-0.1930	10:25	100.7146818
0.957469671	96.4430025	0.7234	10:30	100.7269529
0.994639112	100.1991723	5.3850	10:47	100.7392241
0.894577916	90.1356096	-0.1720	10:55	100.7576959
0.776845887	78.2792007	-0.5125	11:01	100.7654182
0.675832917	68.1058935	-0.4860	11:06	100.7732707
0.575414911	57.9974696	-0.3895	11:12	100.7924342
0.475372242	47.9119604	-0.2763	11:17	100.7883004
0.375170096	37.8188590	-0.1476	11:22	100.8045670
0.275049568	27.7287929	-0.0241	11:28	100.8138029
0.175062644	17.6522552	0.0787	11:33	100.8339347
0.130263480	13.1345298	0.1108	11:39	100.8304845

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Automatic degas:	No		

Isotherm Linear Plot

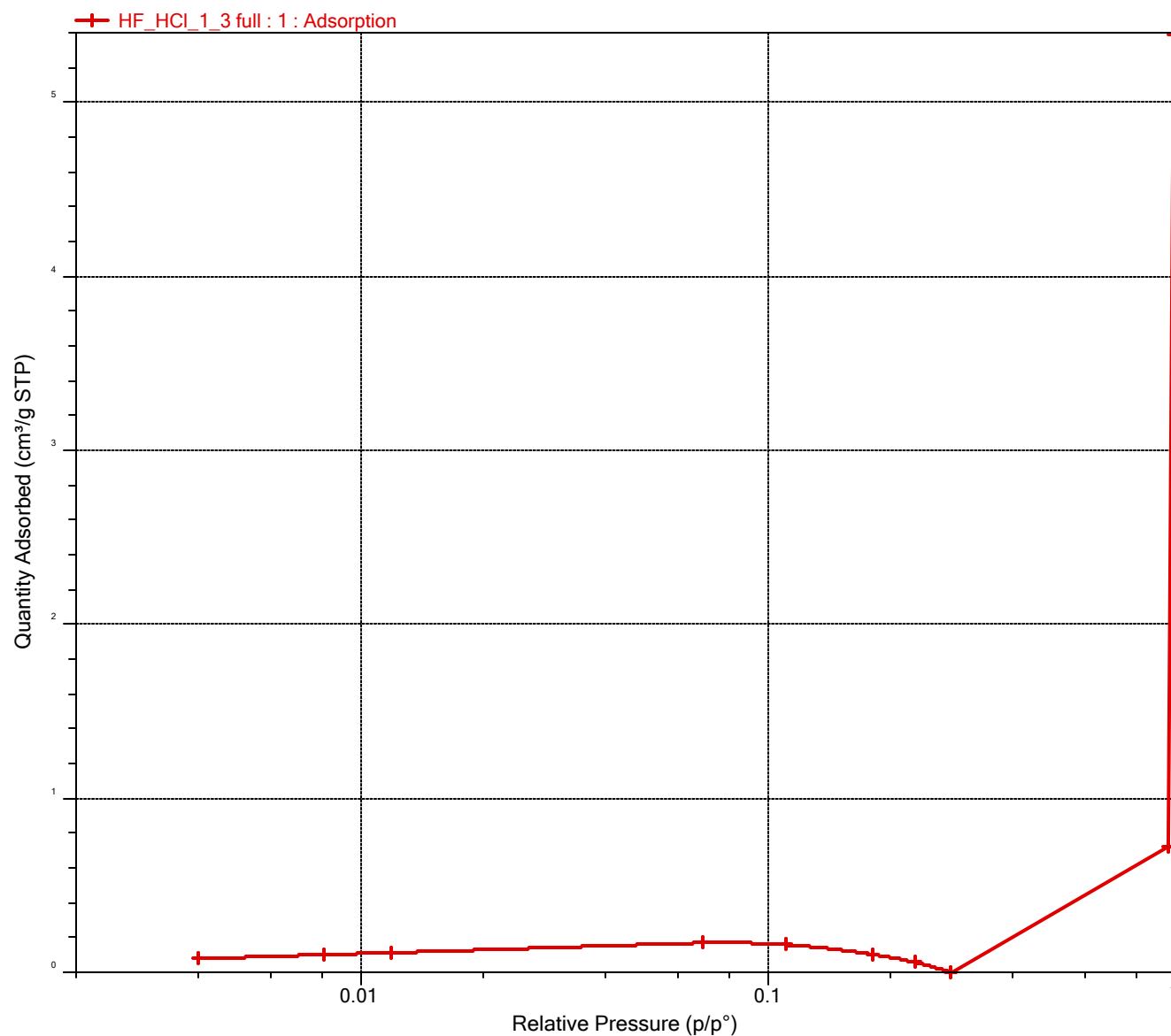


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Isotherm Log Plot



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Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

BET Report

BET surface area: 0,7380 ± 0,0103 m²/g
 Slope: 5,864947 ± 0,082395 g/cm³ STP
 Y-intercept: 0,032833 ± 0,002907 g/cm³ STP
 C: 179,630026
 Qm: 0,1696 cm³/g STP
 Correlation coefficient: 0,9998027
 Molecular cross-sectional area: 0,1620 nm²

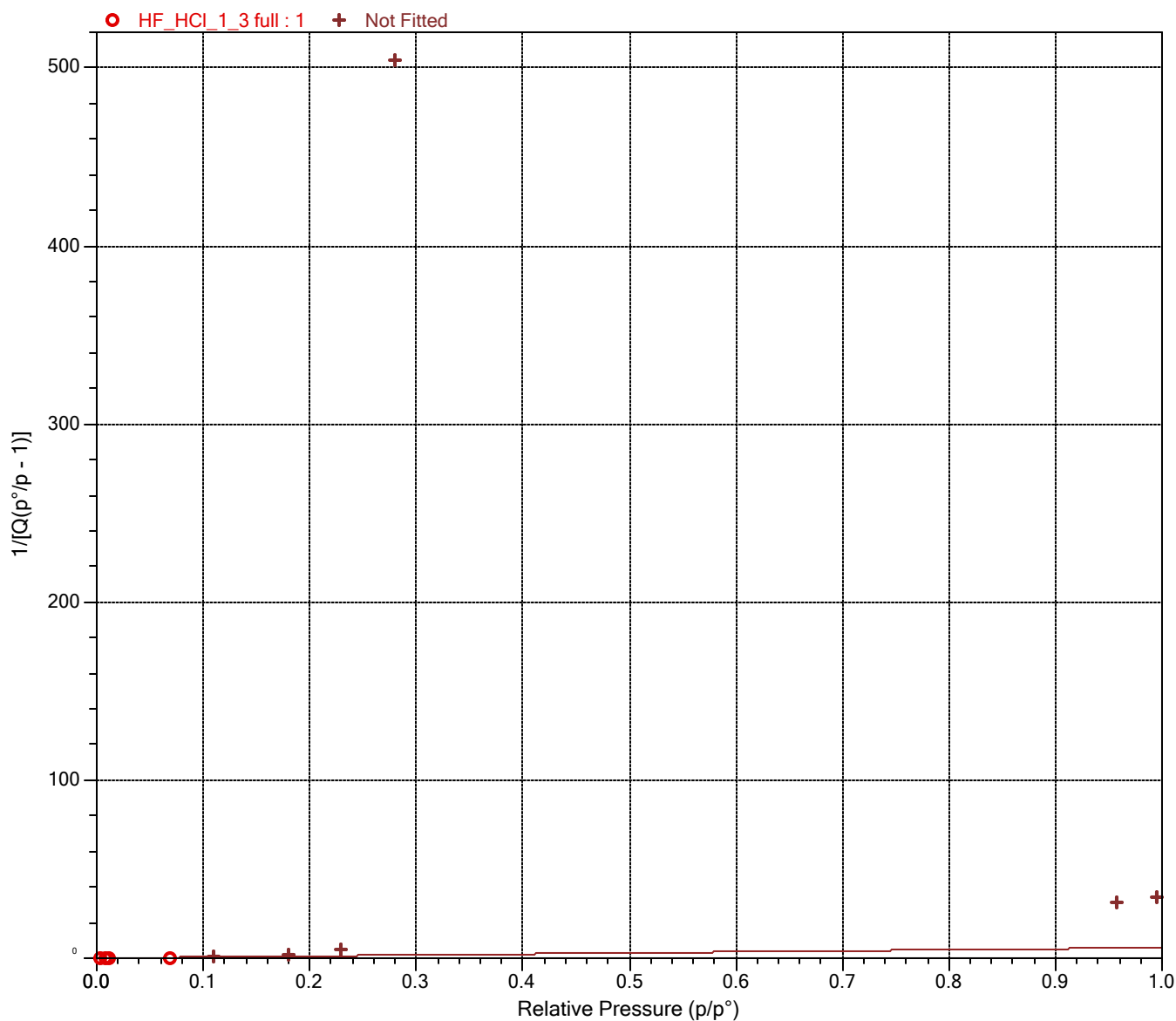
Relative Pressure (p/p°)	Quantity Adsorbed (cm ³ /g STP)	1/[Q(p°/p - 1)]
0.003994745	0.0772	0.051985
0.008158349	0.1014	0.081117
0.011922298	0.1126	0.107164
0.068950039	0.1696	0.436655

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Analysis free space:	84,0724 cm ³	Equilibration interval:	30 s
Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

BET Surface Area Plot



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Sample mass:	0,3771 g	Ambient free space:	28,3522 cm ³ Entered
Analysis free space:	84,0724 cm ³	Equilibration interval:	30 s
Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

t-Plot Report

Micropore volume:	0,001026 cm ³ /g
Micropore area:	2,8356 m ² /g
External surface area:	-2,0976 m ² /g
Slope:	-1,356060 ± 0,070910 cm ³ /g-nm STP
Y-intercept:	0,663618 ± 0,030698 cm ³ /g STP
Correlation coefficient:	-0,997277
Surface area correction factor:	1,000
Density conversion factor:	0,0015468
Total surface area (BET):	0,7380 m ² /g
Thickness range:	0,35000 to 0,50000 nm
Thickness equation:	Carbon Black STSA

Thickness Curve

$$t = 2.98 + 6.45 (p/p^\circ) + 0.88 (p/p^\circ)^2$$

t-Plot Report - Data

Relative Pressure (p/p°)	Statistical Thickness (nm)	Quantity Adsorbed (cm ³ /g STP)	Fitted
0.068950039	0.34289	0.1696	
0.110187979	0.37014	0.1578	
0.179910098	0.41689	0.1028	
0.229782876	0.45086	0.0563	
0.279819579	0.48537	0.0008	

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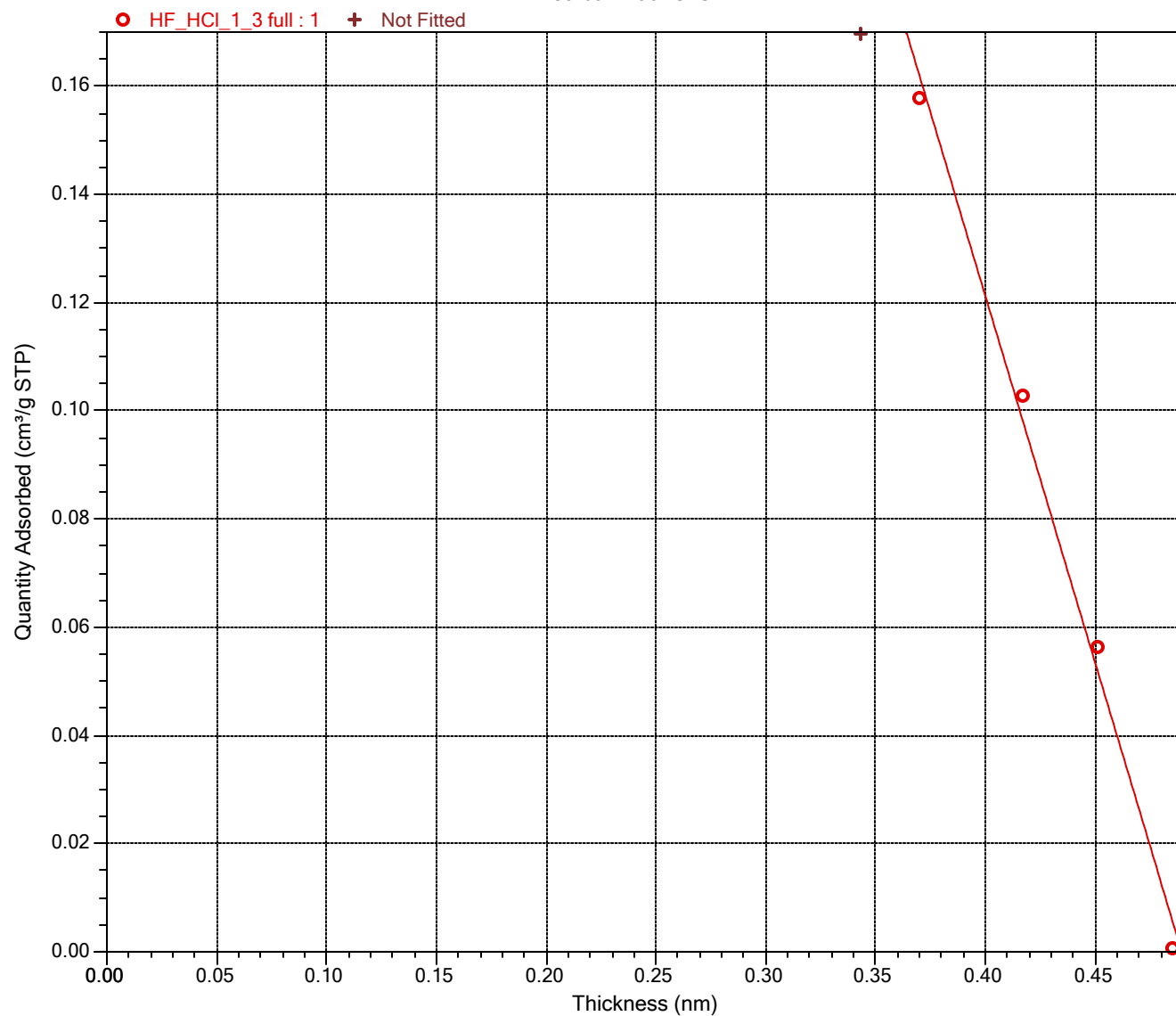
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Sample mass: 0,3771 g
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Low pressure dose: 1,0000 cm³/g STP
Automatic degas: No

Analysis adsorptive: N₂
Analysis bath temp.: 77,300 K
Thermal correction: Yes
Ambient free space: 28,3522 cm³ Entered
Equilibration interval: 30 s
Sample density: 1,000 g/cm³

t-Plot

Carbon Black STSA



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Analysis free space:	84,0724 cm ³	Equilibration interval:	30 s
Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Horvath-Kawazoe Report Cylinder Pore Geometry (Saito-Foley)

Maximum pore volume: 0,000262 cm³/g
at Relative Pressure: 0,068950039
Median pore width: 1,1989 nm
Relative pressure range: 1e-09 to 0.18

Diameter of adsorptive molecule: 0,3000 nm
Adsorptive density: 6.710e+14 molecules/cm²
Adsorptive dispersion constant: 7.777e-59
Diameter of sample atom: 0,3400 nm
Sample Density: 3.845e+15 molecules/cm²
Sample dispersion constant: 6.036e-59

Density conversion factor: 0,0015468

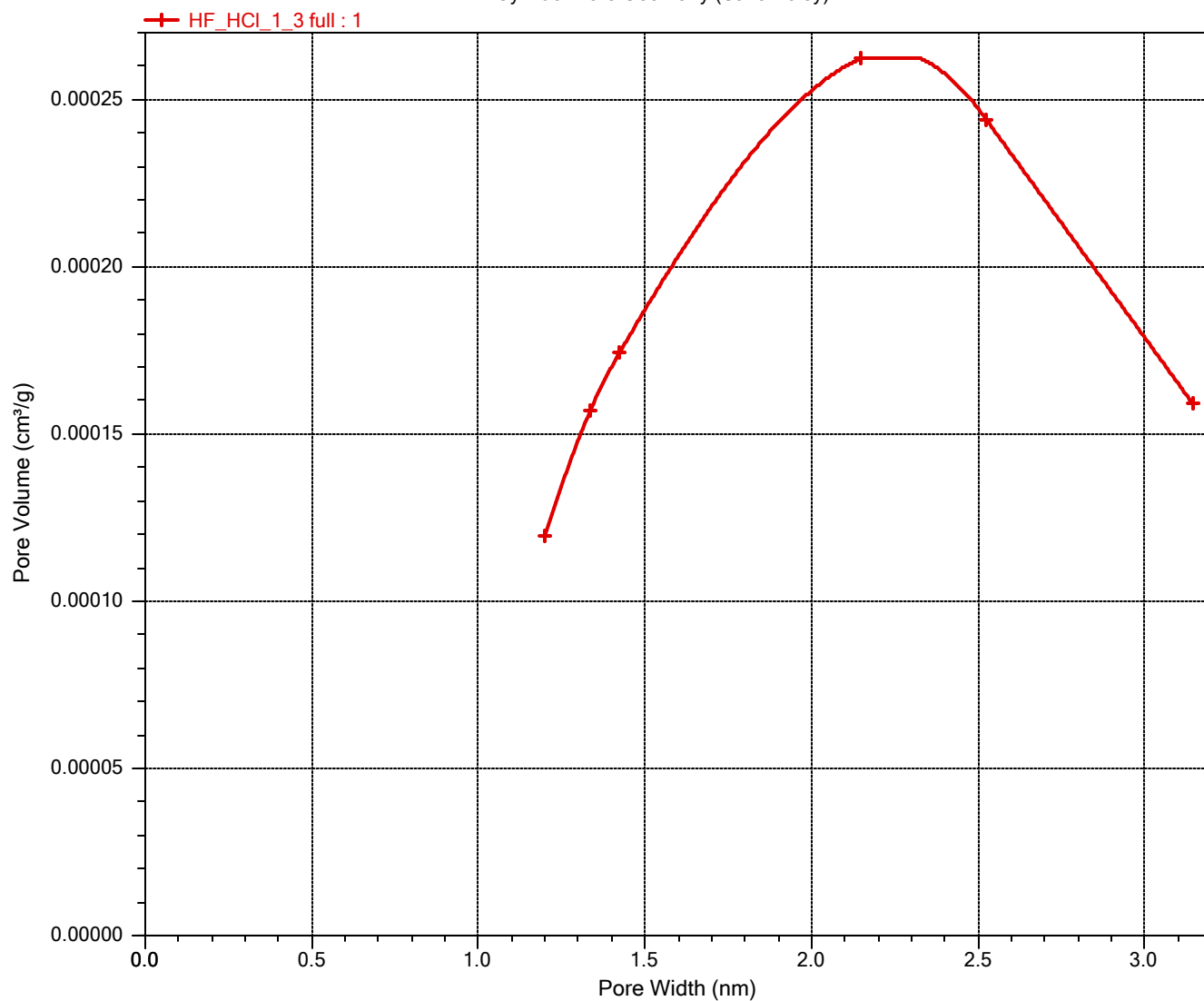
Absolute Pressure (kPa)	Relative Pressure (p/p°)	Quantity Adsorbed (cm ³ /g STP)	Pore Width (nm)	Cumulative Pore Volume (cm ³ /g)	Smoothed Differential Pore Volume (cm ³ /g·nm)
0.40016	0.003994745	0.07715	1.199	0.0001	0.0003
0.81818	0.008158349	0.10140	1.334	0.0002	0.0002
1.19903	0.011922298	0.11260	1.423	0.0002	0.0002
6.93480	0.068950039	0.16960	2.146	0.0003	0.0000
11.08245	0.110187979	0.15782	2.526	0.0002	-0.0001
18.09605	0.179910098	0.10275	3.145	0.0002	-0.0001

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Sample mass:	0,3771 g	Ambient free space:	28,3522 cm ³ Entered
Analysis free space:	84,0724 cm ³	Equilibration interval:	30 s
Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Horvath-Kawazoe Cumulative Pore Volume Plot

Cylinder Pore Geometry (Saito-Foley)

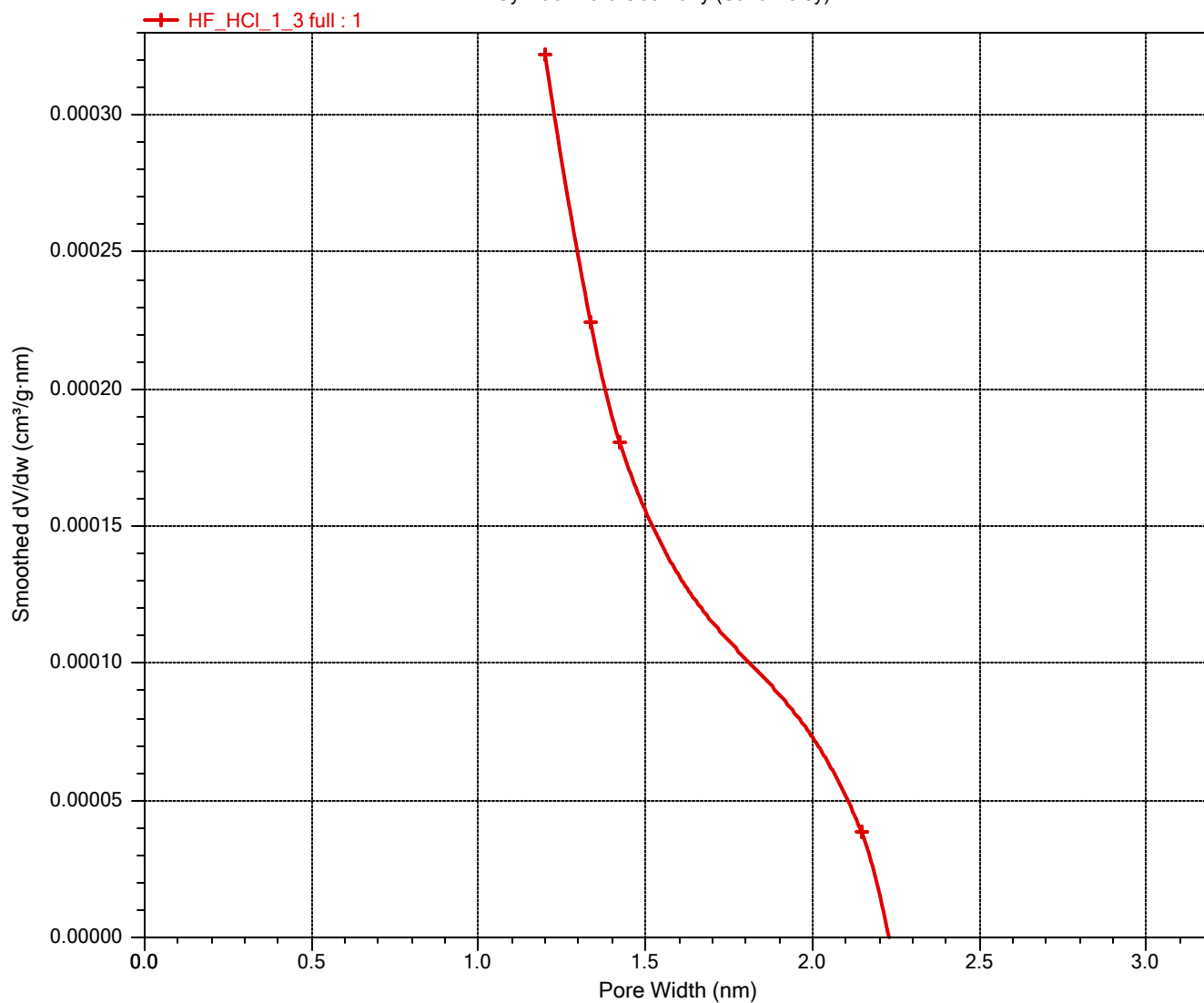


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Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Horvath-Kawazoe Differential Pore Volume Plot

Cylinder Pore Geometry (Saito-Foley)



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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: 0,04079 cm³/g STP

Volume in Pores	<	1,559 nm	0,00017 cm ³ /g
Total Volume in Pores	<=	3,525 nm	0,00017 cm ³ /g
Area in Pores	>	3,525 nm	0,000 m ² /g
Total Area in Pores	>=	1,559 nm	0,000 m ² /g

Pore Table				
Pore Width (nm)	Cumulative Pore Volume (cm ³ /g)	Incremental Pore Volume (cm ³ /g)	Cumulative Pore Area (m ² /g)	Incremental Pore Area (m ² /g)
1.559	0.00017	0.00000	0.000	0.000
1.594	0.00017	0.00000	0.000	0.000
1.630	0.00017	0.00000	0.000	0.000
1.666	0.00017	0.00000	0.000	0.000
1.702	0.00017	0.00000	0.000	0.000
1.737	0.00017	0.00000	0.000	0.000
1.773	0.00017	0.00000	0.000	0.000
1.809	0.00017	0.00000	0.000	0.000
1.844	0.00017	0.00000	0.000	0.000
1.880	0.00017	0.00000	0.000	0.000
1.916	0.00017	0.00000	0.000	0.000
1.952	0.00017	0.00000	0.000	0.000
1.987	0.00017	0.00000	0.000	0.000
2.023	0.00017	0.00000	0.000	0.000
2.059	0.00017	0.00000	0.000	0.000
2.095	0.00017	0.00000	0.000	0.000
2.130	0.00017	0.00000	0.000	0.000
2.166	0.00017	0.00000	0.000	0.000
2.238	0.00017	0.00000	0.000	0.000
2.309	0.00017	0.00000	0.000	0.000
2.381	0.00017	0.00000	0.000	0.000
2.452	0.00017	0.00000	0.000	0.000
2.524	0.00017	0.00000	0.000	0.000
2.595	0.00017	0.00000	0.000	0.000
2.667	0.00017	0.00000	0.000	0.000
2.738	0.00017	0.00000	0.000	0.000
2.810	0.00017	0.00000	0.000	0.000
2.881	0.00017	0.00000	0.000	0.000
2.953	0.00017	0.00000	0.000	0.000
3.024	0.00017	0.00000	0.000	0.000
3.096	0.00017	0.00000	0.000	0.000

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Automatic degas:	No		

Pore Width (nm)	Cumulative Pore Volume (cm ³ /g)	Pore Table		
		Incremental Pore Volume (cm ³ /g)	Cumulative Pore Area (m ² /g)	Incremental Pore Area (m ² /g)
3.167	0.00017	0.00000	0.000	0.000
3.239	0.00017	0.00000	0.000	0.000
3.310	0.00017	0.00000	0.000	0.000
3.382	0.00017	0.00000	0.000	0.000
3.453	0.00017	0.00000	0.000	0.000
3.525	0.00017	0.00000	0.000	0.000

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Method: Non-negative Regularization: 0,01000
Standard Deviation of Fit: 0,04079 cm³/g STP

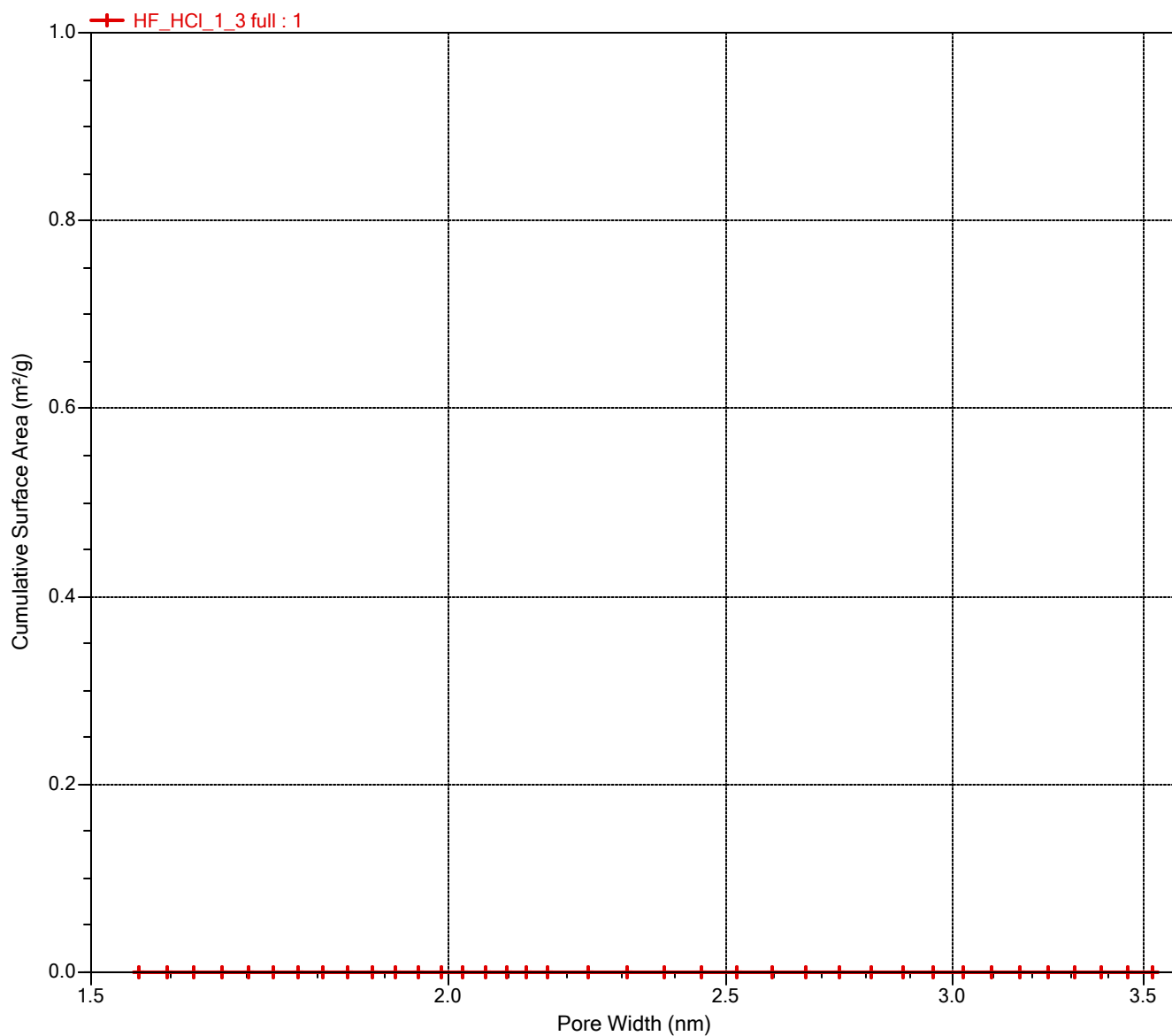
Isotherm Table				
Relative Pressure (p/p°)	Experimental Quantity Adsorbed (cm ³ /g STP)	Fitted Quantity Adsorbed (cm ³ /g STP)	Absolute Residual (cm ³ /g STP)	Relative Residual
0.005011868	0.0842	0.1161	-0.0319	-0.378590
0.006309579	0.0922	0.1166	-0.0244	-0.263975
0.007943276	0.1005	0.1171	-0.0166	-0.165328
0.010000000	0.1081	0.1176	-0.0096	-0.088462
0.012355640	0.1133	0.1181	-0.0048	-0.042543
0.015186320	0.1178	0.1190	-0.0012	-0.009848
0.018485530	0.1230	0.1195	0.0035	0.028724
0.022294740	0.1288	0.1198	0.0090	0.069707
0.026653420	0.1352	0.1201	0.0151	0.111388
0.031598160	0.1420	0.1204	0.0216	0.152214
0.037162240	0.1490	0.1206	0.0284	0.190628
0.043374470	0.1559	0.1208	0.0351	0.225008
0.050259210	0.1621	0.1210	0.0411	0.253588
0.057835260	0.1669	0.1211	0.0458	0.274268
0.066115920	0.1695	0.1213	0.0482	0.284237
0.075109080	0.1694	0.1214	0.0479	0.282969
0.084815920	0.1683	0.1216	0.0468	0.277883
0.095232370	0.1658	0.1217	0.0441	0.265898
0.106348200	0.1604	0.1218	0.0386	0.240884
0.118147500	0.1519	0.1219	0.0300	0.197724
0.130609100	0.1426	0.1220	0.0207	0.144842
0.143706600	0.1327	0.1221	0.0106	0.079918
0.157410500	0.1219	0.1222	-0.0003	-0.002499
0.171685500	0.1100	0.1222	-0.0123	-0.111597
0.186492100	0.0969	0.1223	-0.0254	-0.261697
0.201792100	0.0836	0.1224	-0.0388	-0.464171
0.217539500	0.0690	0.1224	-0.0534	-0.773999
0.233689500	0.0520	0.1225	-0.0705	-1.357852
0.250196100	0.0336	0.1226	-0.0889	-2.643269
0.267011800	0.0150	0.1226	-0.1076	-7.184198

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File: C:\Users\barto\OneDrive - Zachodniopomorski Uniwersytet Technologiczny w
Szcz... \HF_HCl_1_3 full.SMP

Started:	14.03.2023 14:41:36	Analysis adsorptive:	N2
Completed:	15.03.2023 02:52:01	Analysis bath temp.:	77,300 K
Report time:	19.10.2023 09:08:12	Thermal correction:	Yes
Sample mass:	0,3771 g	Ambient free space:	28,3522 cm ³ Entered
Analysis free space:	84,0724 cm ³	Equilibration interval:	30 s
Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

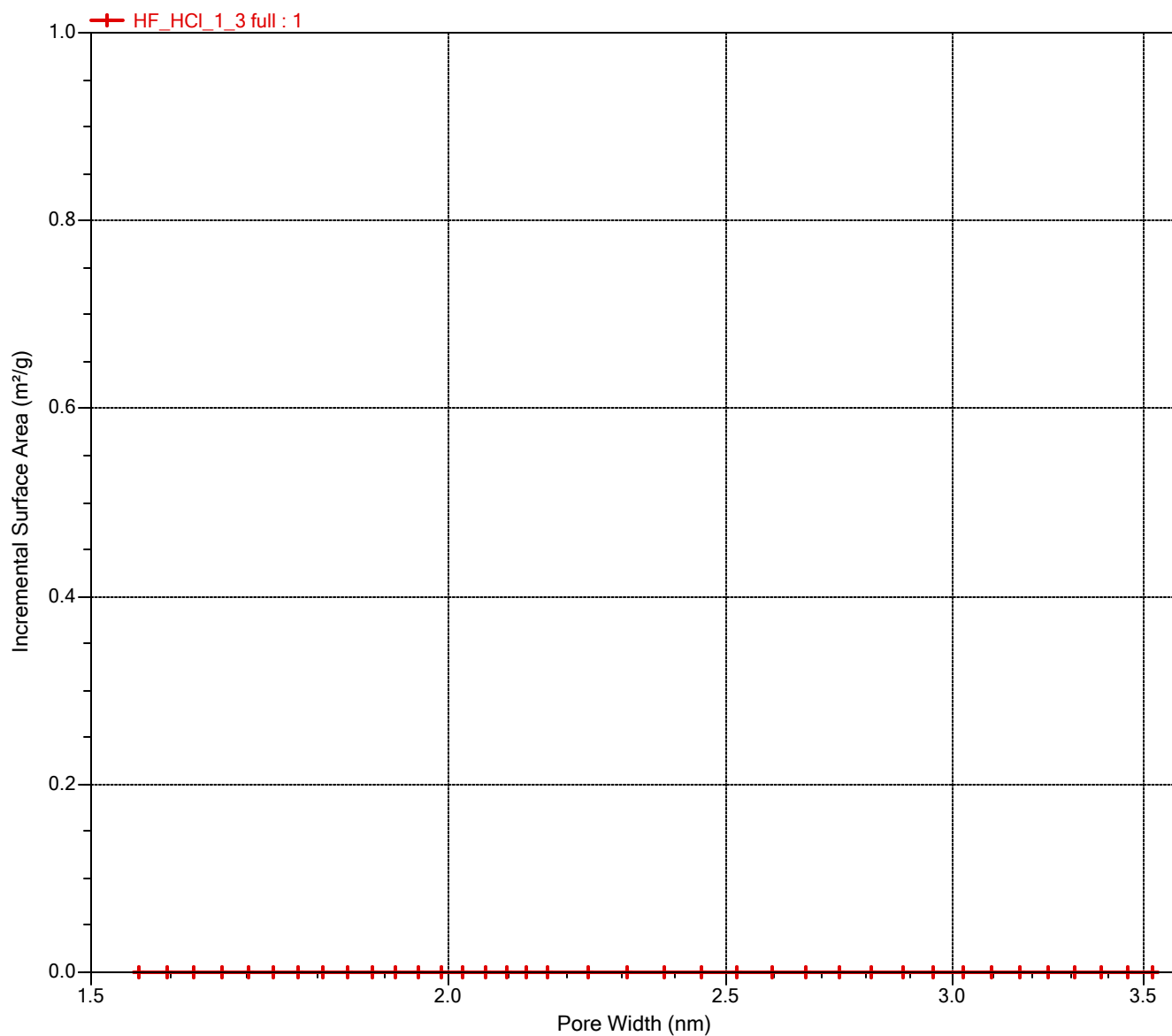
Cumulative Surface Area vs. Pore Width



Sample: 1
Operator:
Submitter:
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Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Incremental Surface Area vs. Pore Width

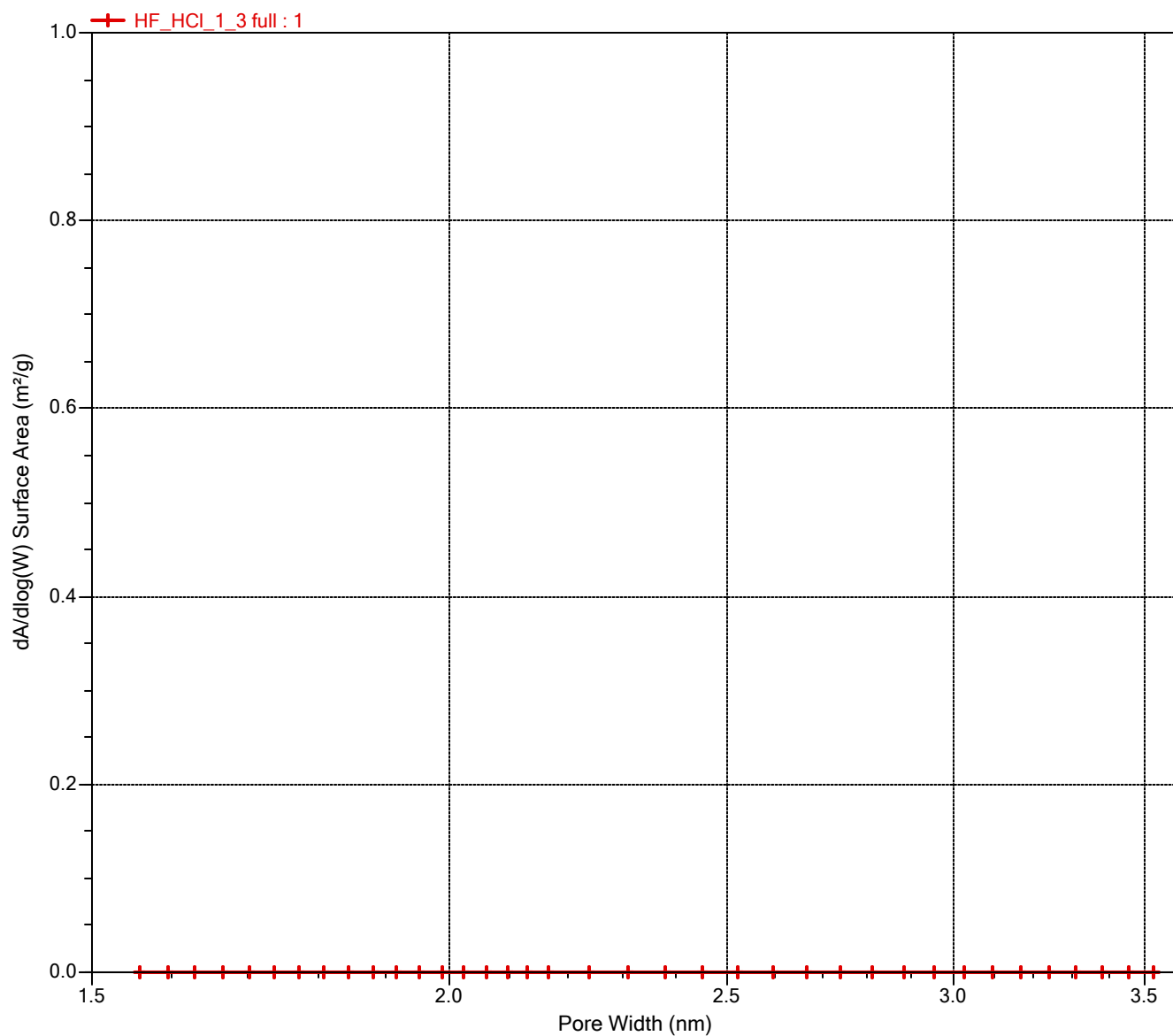


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Operator:
Submitter:

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Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

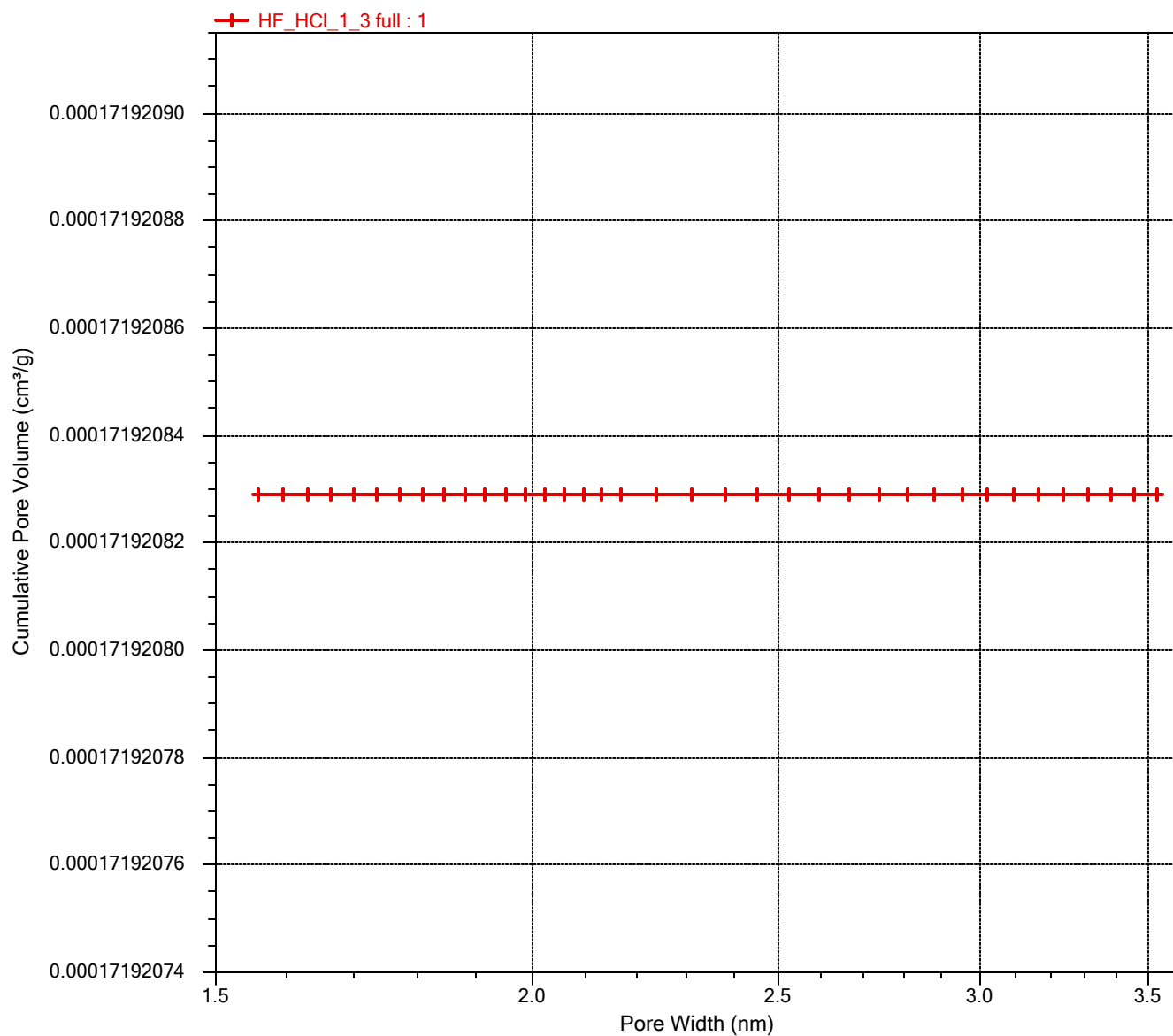
dA/dlog(W) Surface Area vs. Pore Width



Sample: 1
Operator:
Submitter:
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Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

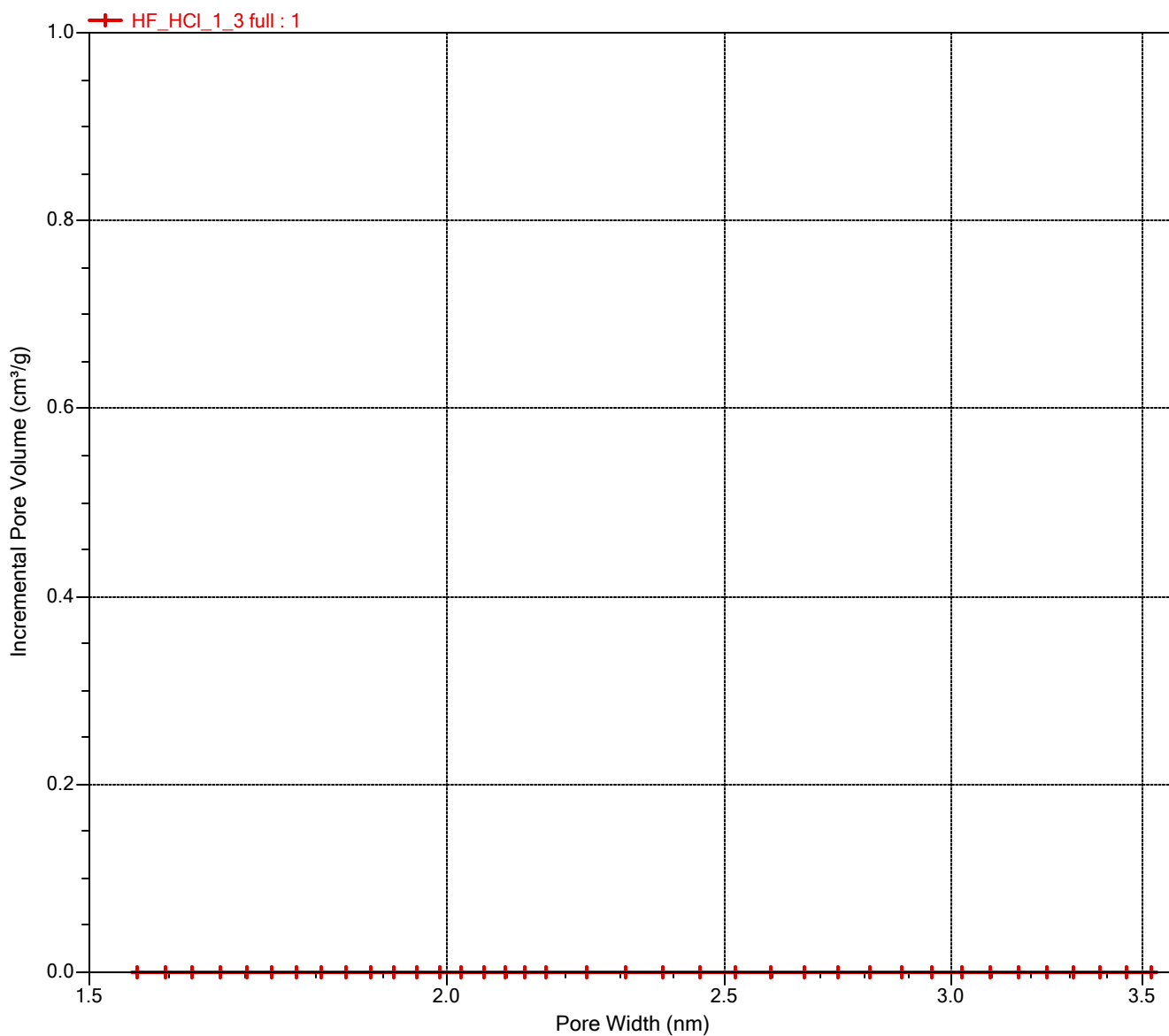
Cumulative Pore Volume vs. Pore Width



Sample: 1
Operator:
Submitter:
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Analysis free space:	84,0724 cm ³	Equilibration interval:	30 s
Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Incremental Pore Volume vs. Pore Width

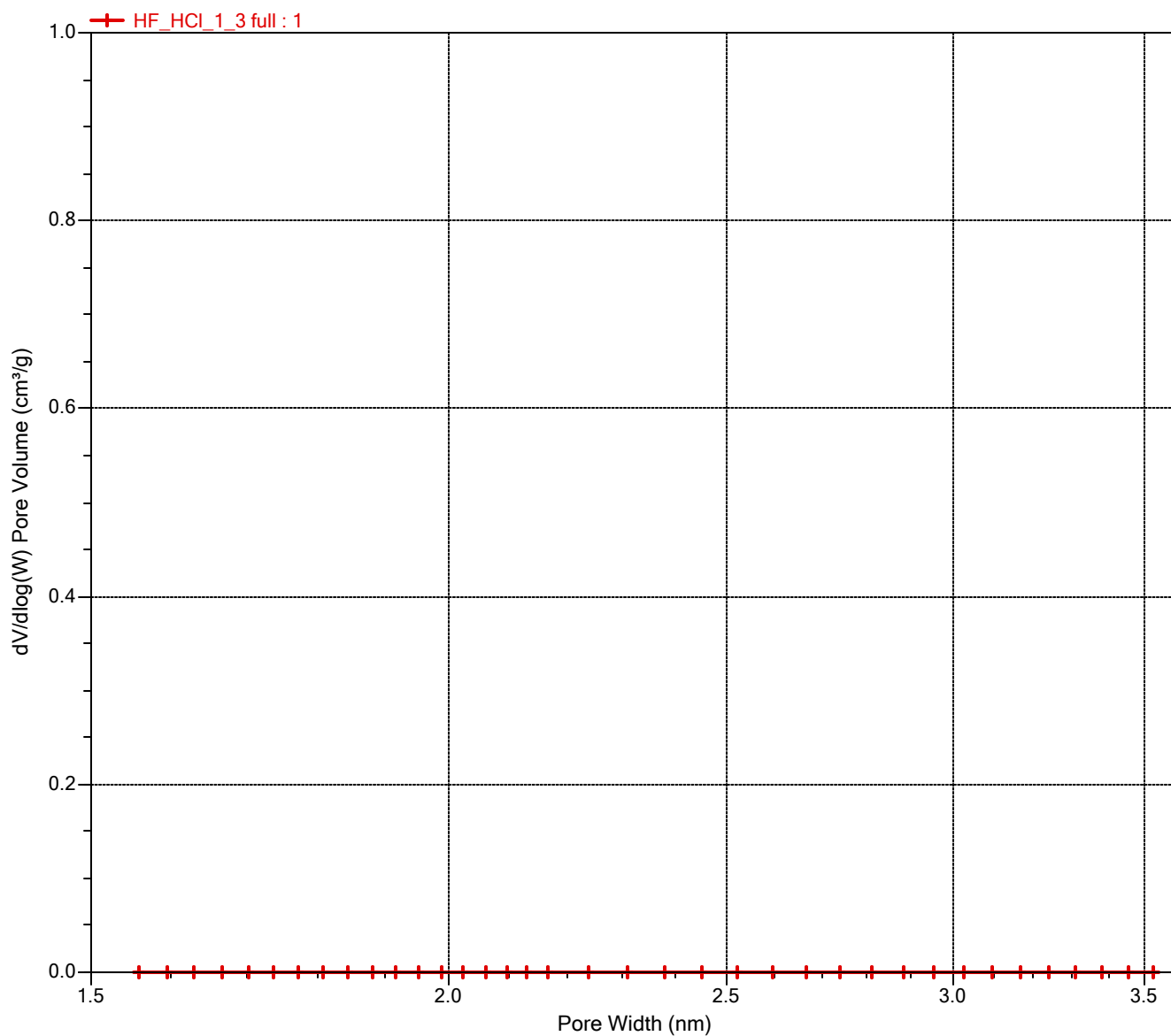


Sample: 1
Operator:
Submitter:

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Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

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



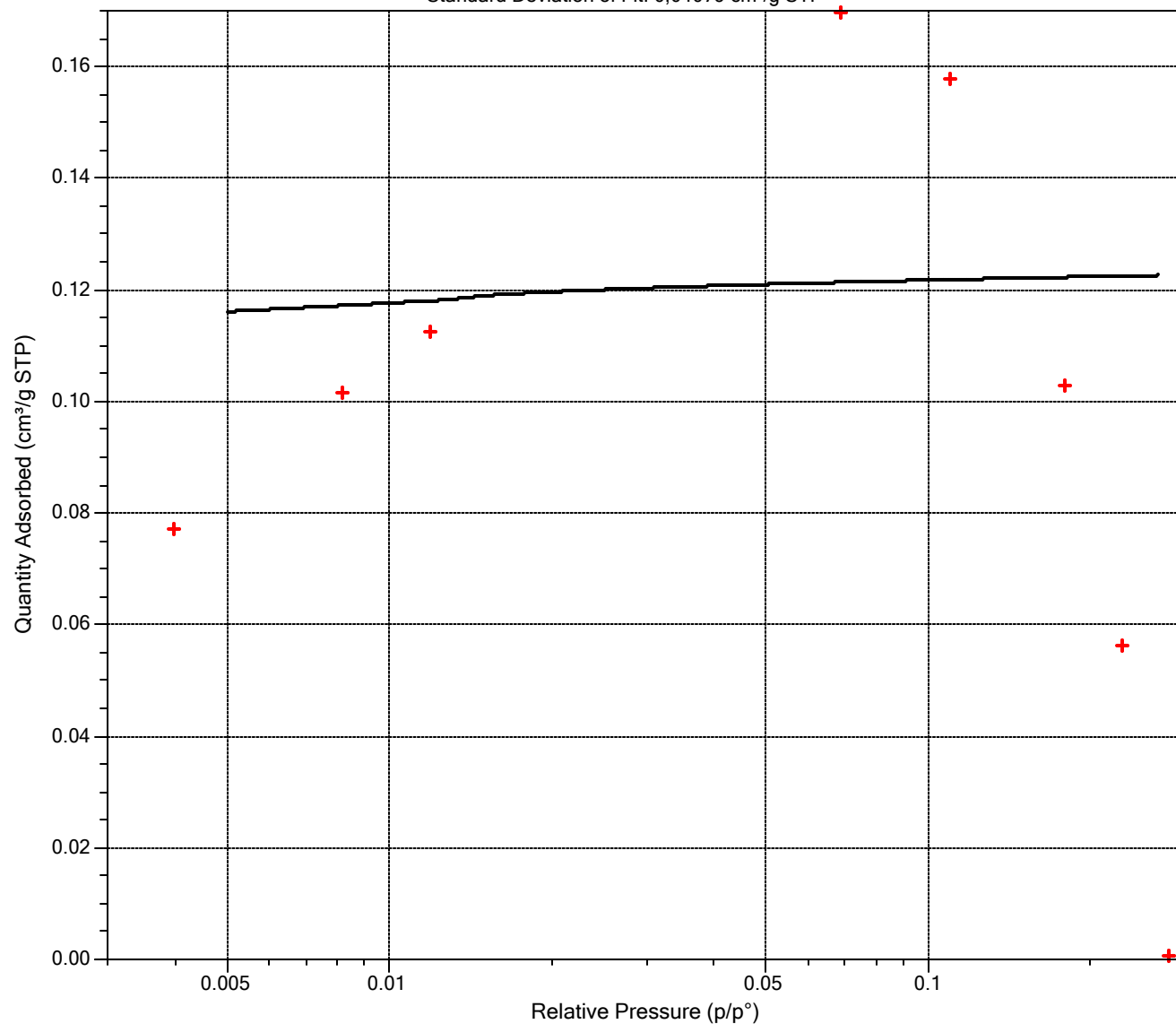
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Automatic degas:	No		

Goodness of Fit

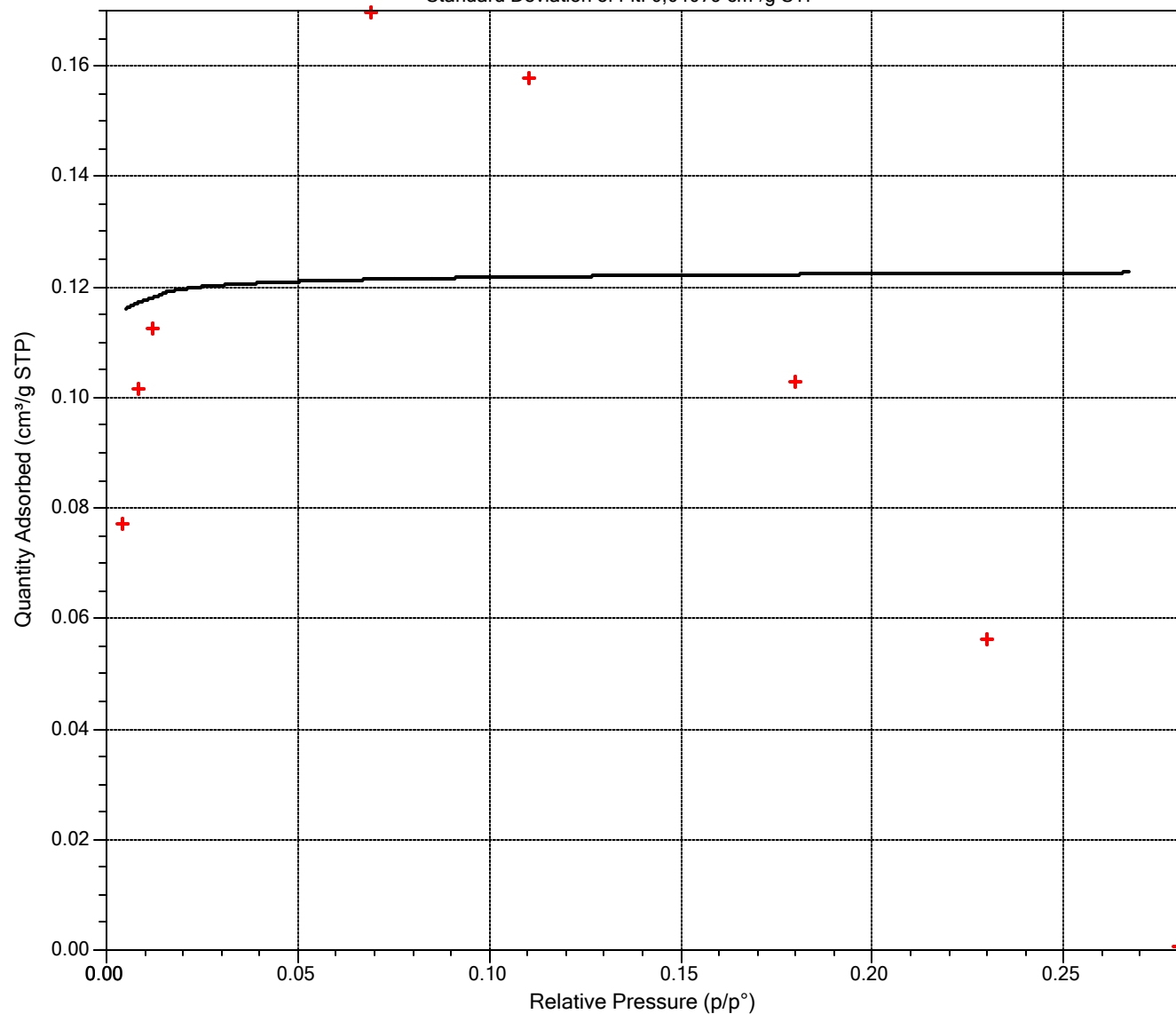
Standard Deviation of Fit: 0,04079 cm³/g STP



Sample: 1
Operator:
Submitter:
File: C:\Users\barto\OneDrive - Zachodniopomorski Uniwersytet Technologiczny w
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Automatic degas:	No		

Goodness of Fit

Standard Deviation of Fit: 0,04079 cm³/g STP


Sample: 1
Operator:
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Low pressure dose:	1,0000 cm ³ /g STP	Sample density:	1,000 g/cm ³
Automatic degas:	No		

Sample Information

Method: FULL- N2@77K- ADS/DES
Sample: 1
Operator:
Submitter:
Mass type: Entered
Sample mass: 0,3771 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: 1
Operator:
Submitter:
File: C:\Users\barto\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: 28,3522 cm³
Analysis free space: 84,0724 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: 1,0000 cm³/g STP
Minimum equilibration delay: 0,50 h
Maximum equilibration delay: 2,00 h
Maximum number of decants: 6

Sample: 1
Operator:
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Low pressure dose:	1,0000 cm ³ /g STP	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: 0,38600 nm
Molecular cross-sectional area: 0,162 nm²
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: 1
Operator:
Submitter:
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Automatic degas:	No		

Sample Log

Date	Time	Log Message
14.03.2023	14:41:36	Starting a sample analysis for C:\ASAP 2460\data\2023\Bartek\1full.SMP on port 1.
14.03.2023	19:47:35	Low pressure data collection started
14.03.2023	23:24:42	Standard data collection started.
15.03.2023	02:28:45	Termination started.
15.03.2023	02:52:01	Finished a sample analysis for C:\ASAP 2460\data\2023\Bartek\1full.SMP on port 1.