

Full Report Set

TriStar II 3020 V1.03 (V1.03)

Unit 1 Port 1

Serial #: 677

Page 1

Sample: KAT_04_run 1
Operator: Feroz BHUIYAN
Submitter: IPPT
File: C:\WIN3020\DATA\IPPT\KAT_01.SMP

Started: 28.07.2017 8:55:38	Analysis Adsorptive: N2
Completed: 28.07.2017 21:58:09	Analysis Bath Temp.: 77.350 K
Report Time: 31.07.2017 8:47:55	Sample Mass: 1.4442 g
Warm Free Space: 10.7690 cm ³ Measured	Cold Free Space: 30.9888 cm ³ Measured
Equilibration Interval: 10 s	Low Pressure Dose: None
Sample Density: 1.000 g/cm ³	Automatic Degas: No

Summary Report

Surface Area

BET Surface Area: 28.7539 m²/g

Pore Volume

Single point adsorption total pore volume of pores
less than 184.1753 nm diameter at $p/p^0 = 0.98938998$: 0.068176 cm³/g

t-Plot micropore volume: 0.000155 cm³/g

BJH Adsorption cumulative volume of pores
between 1.7000 nm and 300.0000 nm diameter: 0.070337 cm³/g

Pore Size

Adsorption average pore width (4V/A by BET): 9.48413 nm

BJH Adsorption average pore diameter (4V/A): 10.0228 nm

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Low Pressure Dose: None
Automatic Degas: No

Isotherm Tabular Report

Relative Pressure (p/p ₀)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm ³ /g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
0.009818364	7.173306	4.6783	01:17	730.455017
0.015254486	11.144814	4.9688	01:46	730.600952
0.020297826	14.829166	5.1708	01:55	730.592590
0.024331412	17.773348	5.3043	02:03	730.579041
0.029617208	21.635275	5.4557	02:10	730.469238
0.034690827	25.336296	5.5852	02:16	730.496765
0.039712067	29.008436	5.7008	02:21	730.345703
0.049388998	36.077110	5.9003	02:26	730.469055
0.071305522	52.088406	6.2825	02:33	730.468567
0.108142582	78.996803	6.8177	02:39	730.496094
0.119615237	87.354218	6.8177	02:47	730.487488
0.138815441	101.399147	6.9705	02:51	730.293396
0.158784859	115.982086	7.2163	02:56	730.460144
0.179657365	131.212280	7.4629	03:02	730.435425
0.199525954	145.741409	7.7115	03:06	730.347351
0.243241882	177.687927	7.9445	03:11	730.438354
0.299618675	218.811569	8.4447	03:17	730.498901
0.352579565	257.493866	9.0773	03:23	730.300171
0.397207108	290.051666	9.6690	03:29	730.314209
0.446455711	326.025482	10.1670	03:35	730.227783
0.496050343	362.211334	10.7256	03:40	730.252686
0.545650946	398.424103	11.3107	03:46	730.190674
0.595367093	434.659149	11.9344	03:52	730.181274
0.644553723	470.544006	12.6081	03:58	730.069153
0.693630355	506.386780	13.3462	04:05	730.030701
0.734422121	536.076599	14.1930	04:12	730.052795
0.765650039	558.935791	15.0148	04:19	729.929810
0.795183656	580.489990	15.7509	04:26	730.014709
0.816375782	595.958008	16.5633	04:33	730.007446
0.836379359	610.566223	17.2511	04:40	730.004517
0.855774875	624.674500	17.9974	04:48	730.011108
0.871484306	636.129395	18.8327	04:56	729.951904
0.886039059	646.747620	19.6277	05:03	729.937866
0.901799458	658.170166	20.5317	05:12	729.931274
0.911978097	665.678162	21.6337	05:21	729.840942
0.922783179	673.520203	22.5022	05:29	729.927795
0.930153790	678.910645	23.5298	05:37	729.879150
0.938998988	685.431091	24.4303	05:45	729.890747
0.944752348	689.521423	25.5665	05:54	729.959351
0.951292889	694.234436	26.4384	06:01	729.843567
0.957523813	698.739502	27.6495	06:10	729.779907
0.962730917	702.545776	28.9933	06:19	729.735901
0.966589979	705.325439	30.2680	06:27	729.742615
0.970675118	708.352478	31.4140	06:36	729.704895
0.973195231	710.076599	32.6675	06:44	729.752380
0.975033356	711.366638	33.4782	06:50	729.634277
0.978050540	713.600037	34.6689	06:58	729.581848
0.977714733	713.383850	35.7776	07:05	729.614685
0.979318651	714.646667	36.0387	07:09	729.644165
0.980957227	715.832581	36.6898	07:15	729.738647
0.982628754	717.016357	37.6129	07:21	729.728638
		38.6244	07:28	729.692017

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Automatic Degas: No

Isotherm Tabular Report

Relative Pressure (p/p ^o)	Absolute Pressure (mmHg)	Quantity Adsorbed (cm ³ /g STP)	Elapsed Time (h:min)	Saturation Pressure (mmHg)
0.984522796	718.451965	39.5918	07:33	729.746399
0.985689949	719.411621	40.5338	07:39	729.855896
0.986610217	720.189087	41.4520	07:45	729.963135
0.989389980	722.276123	44.0758	07:59	730.021667

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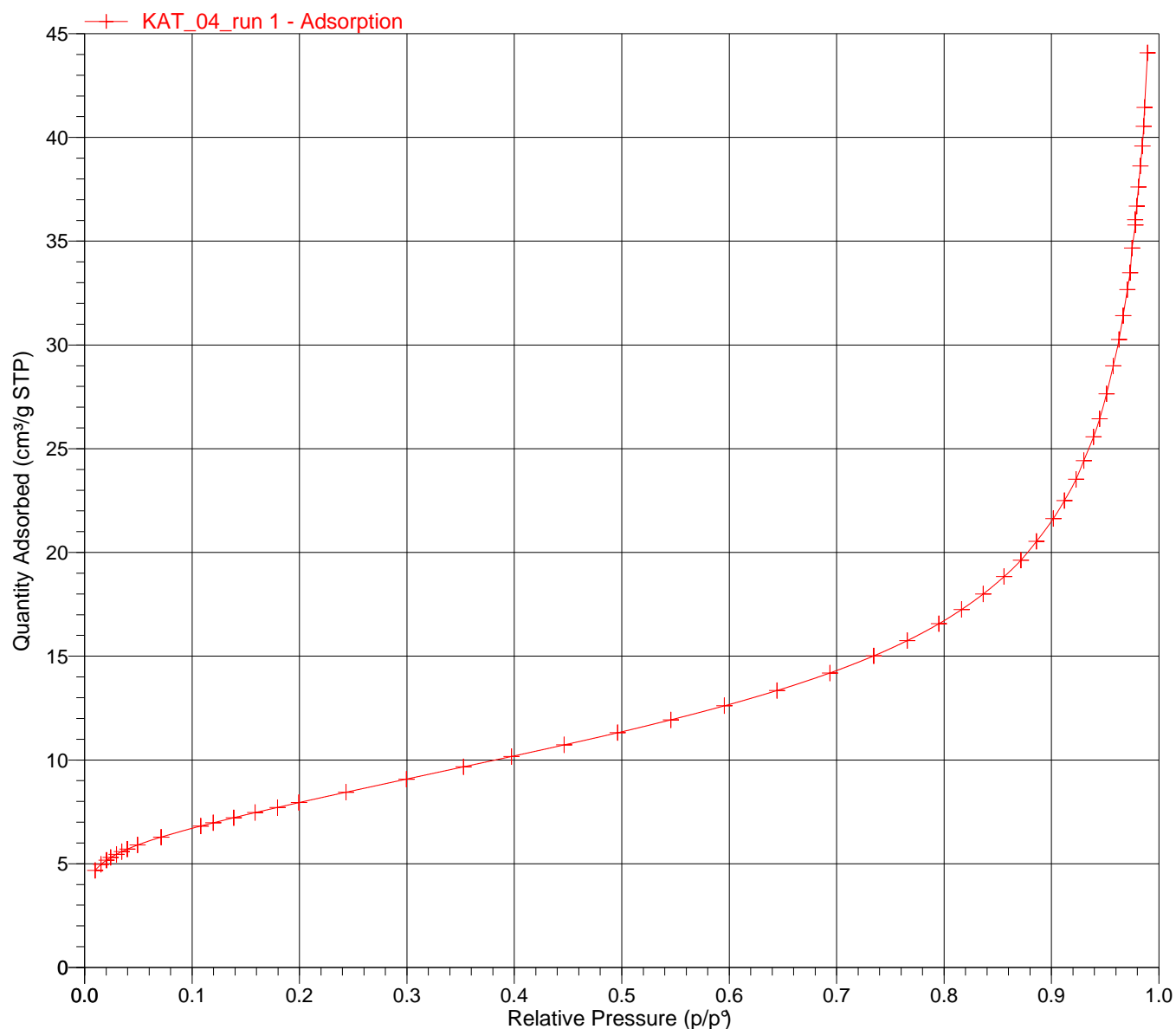
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Isotherm Linear Plot



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BET Surface Area Report

BET Surface Area: 28.7539 ± 0.0867 m²/g
Slope: 0.149891 ± 0.000452 g/cm³ STP
Y-Intercept: 0.001504 ± 0.000062 g/cm³ STP
C: 100.641299
Qm: 6.6052 cm³/g STP
Correlation Coefficient: 0.9999727
Molecular Cross-Sectional Area: 0.1620 nm²

Relative Pressure (p/p ⁰)	Quantity Adsorbed (cm ³ /g STP)	1/[Q(p ⁰ p - 1)]
0.049388998	5.9003	0.008805
0.071305522	6.2825	0.012221
0.108142582	6.8177	0.017785
0.119615237	6.9705	0.019492
0.138815441	7.2163	0.022337
0.158784859	7.4629	0.025293
0.179657365	7.7115	0.028399
0.199525954	7.9445	0.031375

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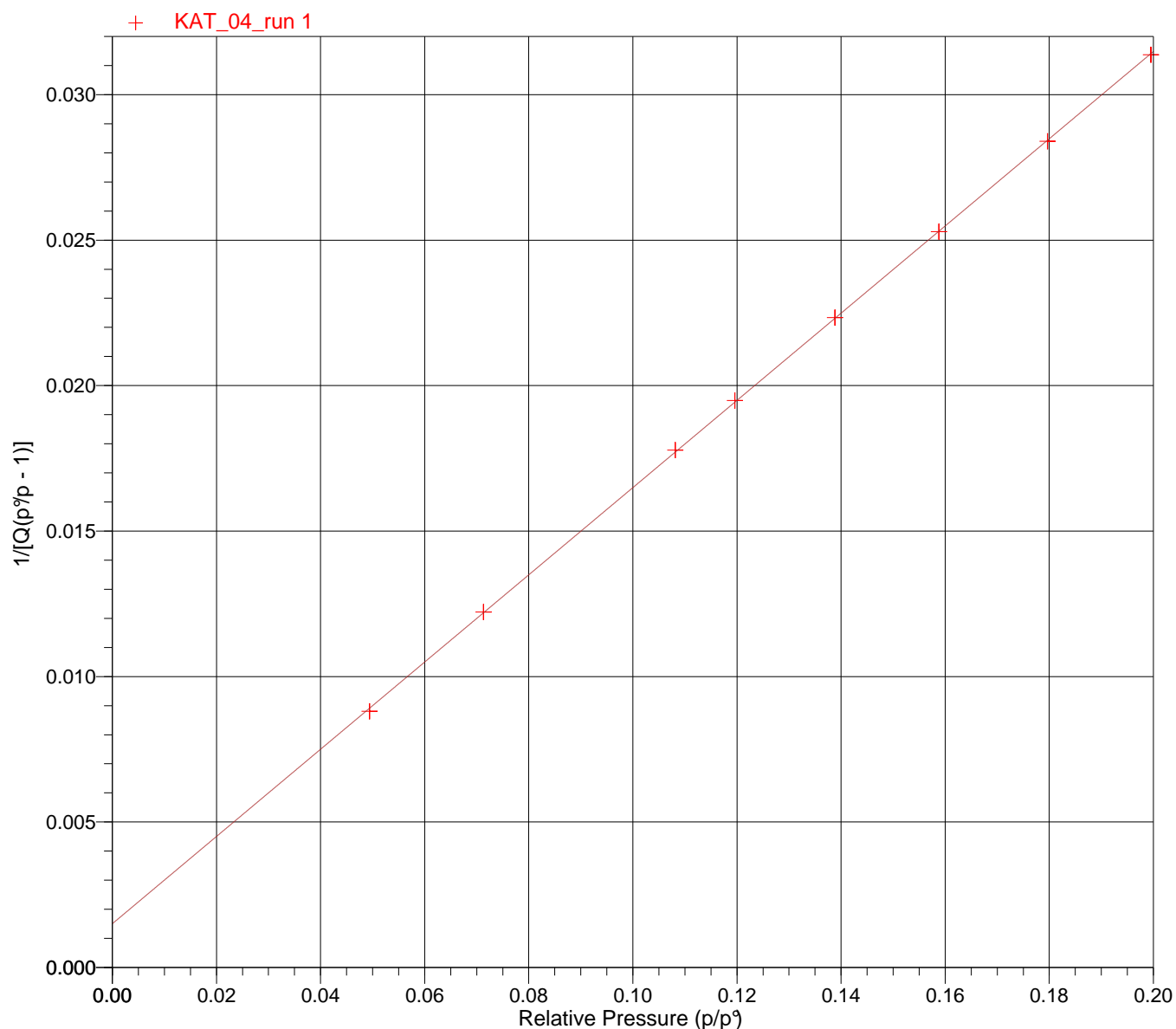
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BET Surface Area Plot



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t-Plot Report

Micropore Volume: 0.000155 cm³/g
Micropore Area: 0.9663 m²/g
External Surface Area: 27.7875 m²/g
Slope: 17.964534 ± 0.023861 cm³/g-nm STP
Y-Intercept: 0.099917 ± 0.009867 cm³/g STP
Correlation Coefficient: 0.999996
Surface Area Correction Factor: 1.000
Density Conversion Factor: 0.0015468
Total Surface Area (BET): 28.7539 m²/g
Thickness Range: 0.35000 nm to 0.50000 nm
Thickness Equation: Harkins and Jura
$$t = [13.99 / (0.034 - \log(p/p^0))] ^{0.5}$$

Relative Pressure (p/p ⁰)	Statistical Thickness (nm)	Quantity Adsorbed (cm ³ /g STP)	Fitted
0.009818364	0.26175	4.6783	
0.015254486	0.27495	4.9688	
0.020297826	0.28466	5.1708	
0.024331412	0.29138	5.3043	
0.029617208	0.29923	5.4557	
0.034690827	0.30603	5.5852	
0.039712067	0.31223	5.7008	
0.049388998	0.32307	5.9003	
0.071305522	0.34420	6.2825	
0.108142582	0.37403	6.8177	*
0.119615237	0.38250	6.9705	*
0.138815441	0.39613	7.2163	*
0.158784859	0.40977	7.4629	*
0.179657365	0.42363	7.7115	*
0.199525954	0.43658	7.9445	*
0.243241882	0.46466	8.4447	*
0.299618675	0.50097	9.0773	
0.352579565	0.53612	9.6690	
0.397207108	0.56712	10.1670	
0.446455711	0.60342	10.7256	
0.496050343	0.64290	11.3107	
0.545650946	0.68623	11.9344	
0.595367093	0.73465	12.6081	
0.644553723	0.78898	13.3462	
0.693630355	0.85168	14.1930	
0.734422121	0.91240	15.0148	

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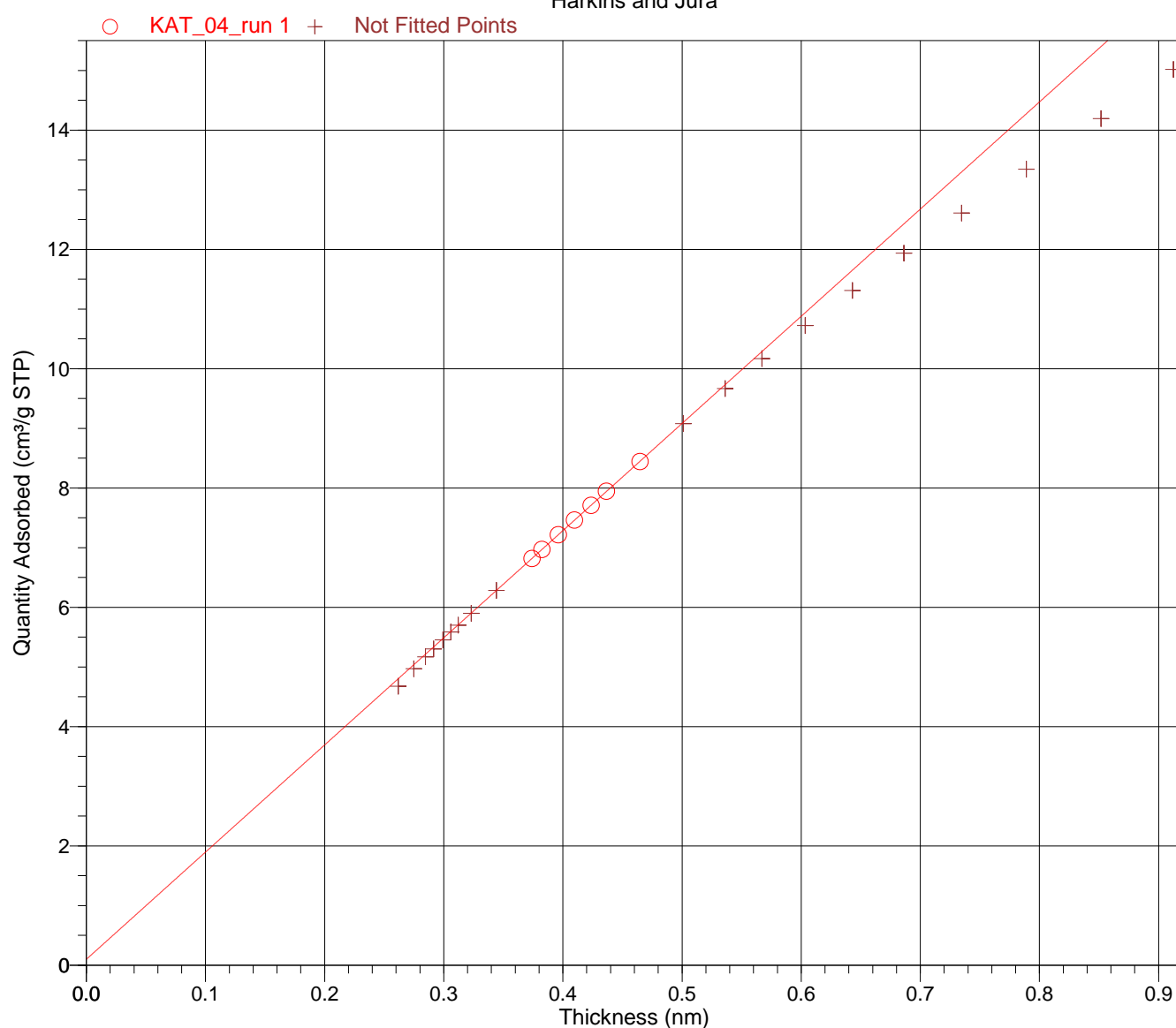
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t-Plot

Harkins and Jura



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Automatic Degas: No

BJH Adsorption Pore Distribution Report

Faas Correction

Halsey

$$t = 3.54 \left[-5 / \ln(p/p^0) \right]^{0.333}$$

Diameter Range: 1.7000 nm to 300.0000 nm

Adsorbate Property Factor: 0.95300 nm

Density Conversion Factor: 0.0015468

Fraction of Pores Open at Both Ends: 0.00

Pore Diameter Range (nm)	Average Diameter (nm)	Incremental Pore Volume (cm ³ /g)	Cumulative Pore Volume (cm ³ /g)	Incremental Pore Area (m ² /g)	Cumulative Pore Area (m ² /g)
184.3 - 146.6	161.1	0.004335	0.004335	0.108	0.108
146.6 - 137.3	141.7	0.001522	0.005857	0.043	0.151
137.3 - 127.2	131.9	0.001563	0.007420	0.047	0.198
127.2 - 113.6	119.6	0.001605	0.009025	0.054	0.252
113.6 - 103.8	108.2	0.001690	0.010714	0.062	0.314
103.8 - 95.7	99.4	0.001547	0.012261	0.062	0.376
95.7 - 89.0	92.1	0.001089	0.013350	0.047	0.424
89.0 - 79.6	83.8	0.002315	0.015665	0.111	0.534
79.6 - 74.3	76.8	0.002031	0.017696	0.106	0.640
74.3 - 68.1	70.9	0.001368	0.019065	0.077	0.717
68.1 - 60.0	63.5	0.002133	0.021198	0.134	0.852
60.0 - 53.9	56.6	0.001969	0.023166	0.139	0.991
53.9 - 47.5	50.3	0.002200	0.025366	0.175	1.166
47.5 - 41.6	44.1	0.002340	0.027706	0.212	1.378
41.6 - 36.8	38.9	0.002126	0.029832	0.219	1.596
36.8 - 33.5	35.0	0.001536	0.031368	0.176	1.772
33.5 - 29.4	31.1	0.002016	0.033384	0.259	2.031
29.4 - 26.7	27.9	0.001622	0.035006	0.233	2.264
26.7 - 23.5	24.9	0.001853	0.036859	0.298	2.562
23.5 - 21.2	22.2	0.001587	0.038446	0.286	2.848
21.2 - 18.3	19.5	0.002032	0.040478	0.416	3.264
18.3 - 16.3	17.2	0.001698	0.042176	0.395	3.659
16.3 - 14.6	15.4	0.001499	0.043674	0.390	4.049
14.6 - 13.0	13.7	0.001594	0.045268	0.466	4.515
13.0 - 11.6	12.2	0.001445	0.046713	0.474	4.989
11.6 - 10.4	10.9	0.001350	0.048063	0.493	5.483
10.4 - 9.2	9.7	0.001617	0.049679	0.667	6.149
9.2 - 8.1	8.6	0.001492	0.051171	0.698	6.847
8.1 - 7.0	7.5	0.001703	0.052875	0.911	7.758
7.0 - 6.1	6.5	0.001807	0.054682	1.117	8.875
6.1 - 5.3	5.6	0.001620	0.056302	1.150	10.025
5.3 - 4.7	5.0	0.001530	0.057832	1.231	11.256
4.7 - 4.2	4.4	0.001469	0.059301	1.326	12.582
4.2 - 3.8	4.0	0.001424	0.060725	1.431	14.013
3.8 - 3.4	3.6	0.001411	0.062136	1.567	15.580
3.4 - 3.2	3.3	0.001306	0.063442	1.590	17.170
3.2 - 2.9	3.0	0.001621	0.065063	2.171	19.341
2.9 - 2.6	2.7	0.001790	0.066853	2.663	22.003
2.6 - 2.4	2.4	0.001432	0.068284	2.342	24.345
2.4 - 2.3	2.3	0.000664	0.068948	1.152	25.497
2.3 - 2.2	2.2	0.000699	0.069647	1.266	26.763
2.2 - 2.1	2.1	0.000690	0.070337	1.307	28.071

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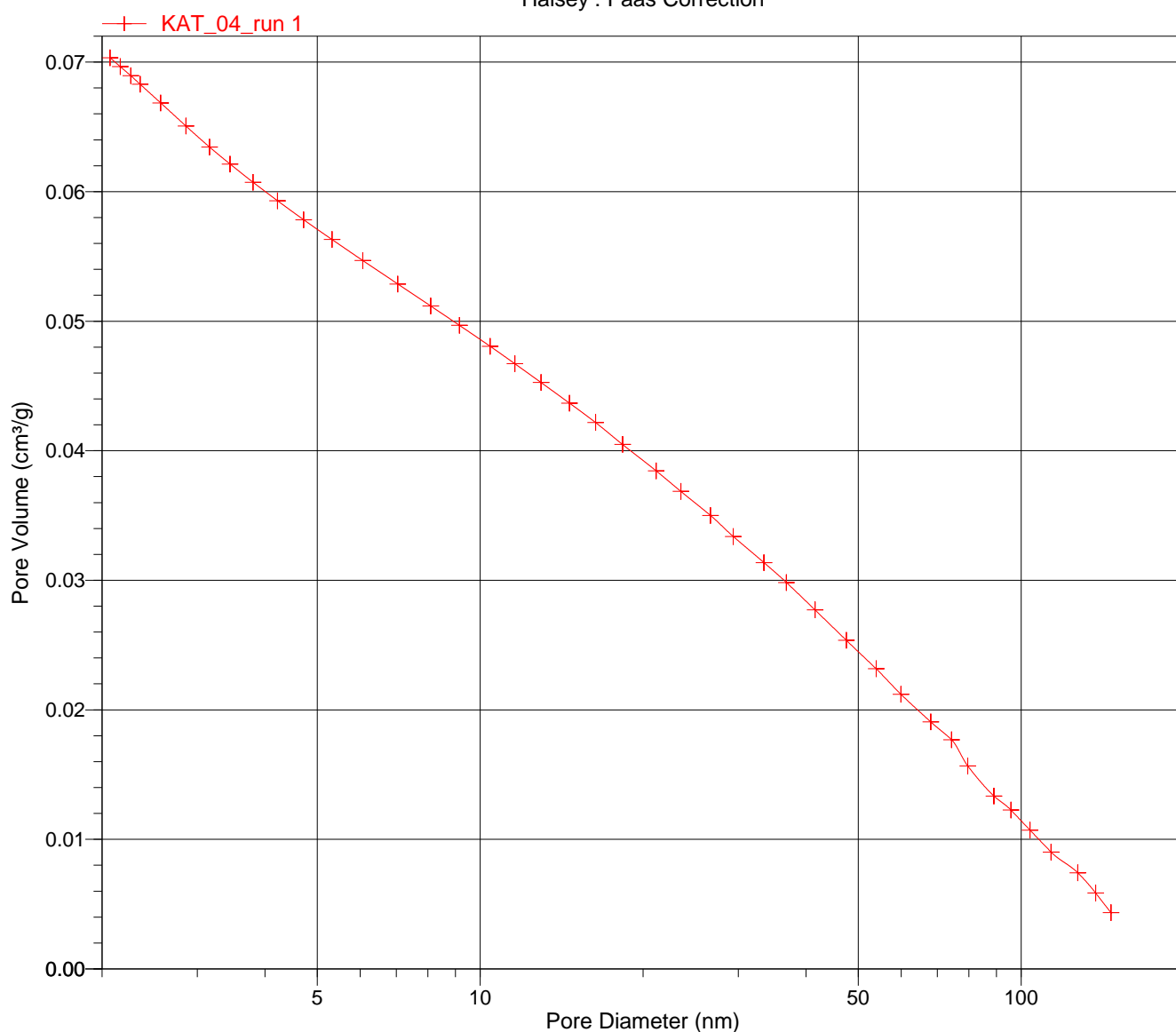
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BJH Adsorption Cumulative Pore Volume (Larger)

Halsey : Faas Correction



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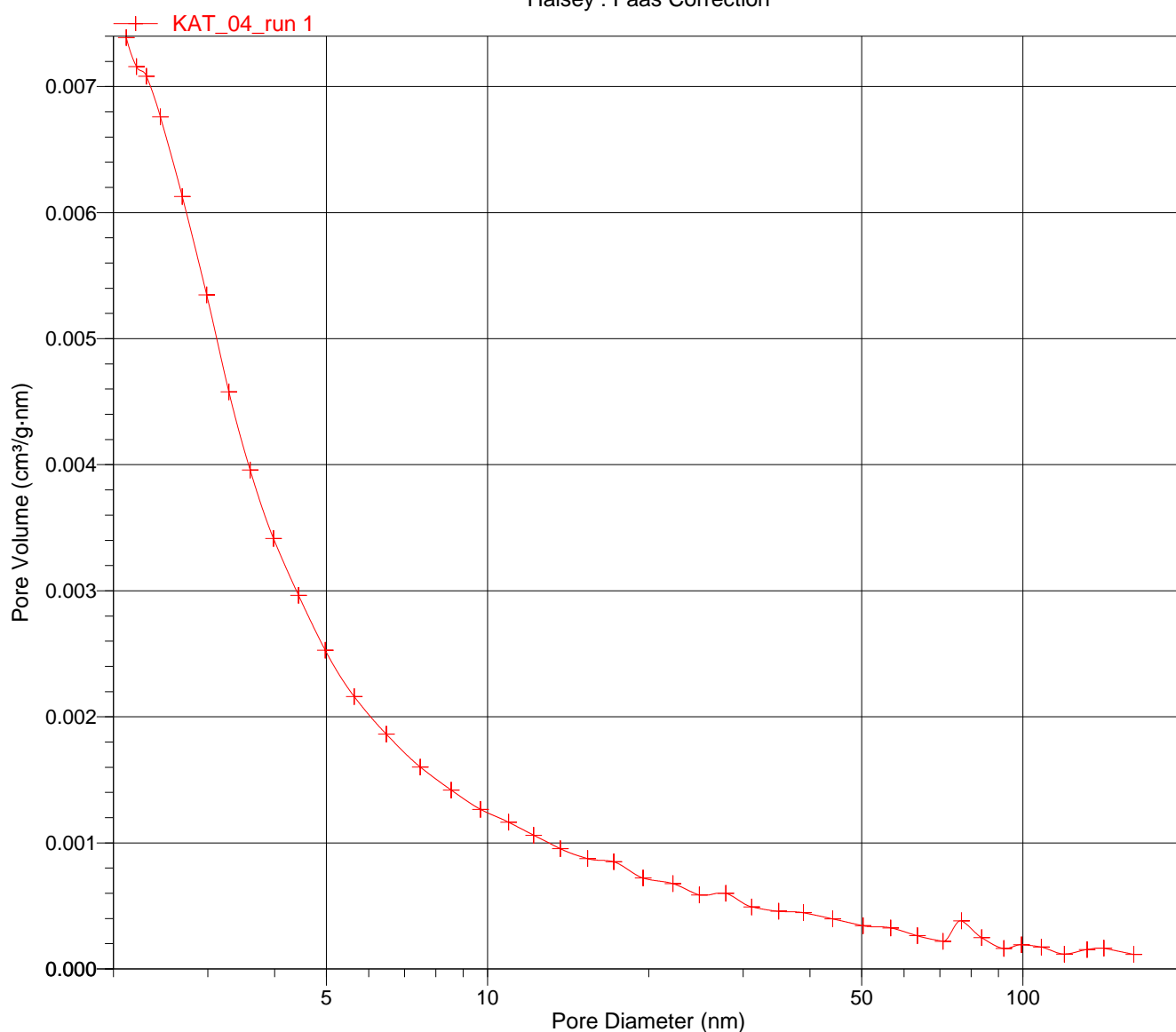
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BJH Adsorption dV/dD Pore Volume

Halsey : Faas Correction



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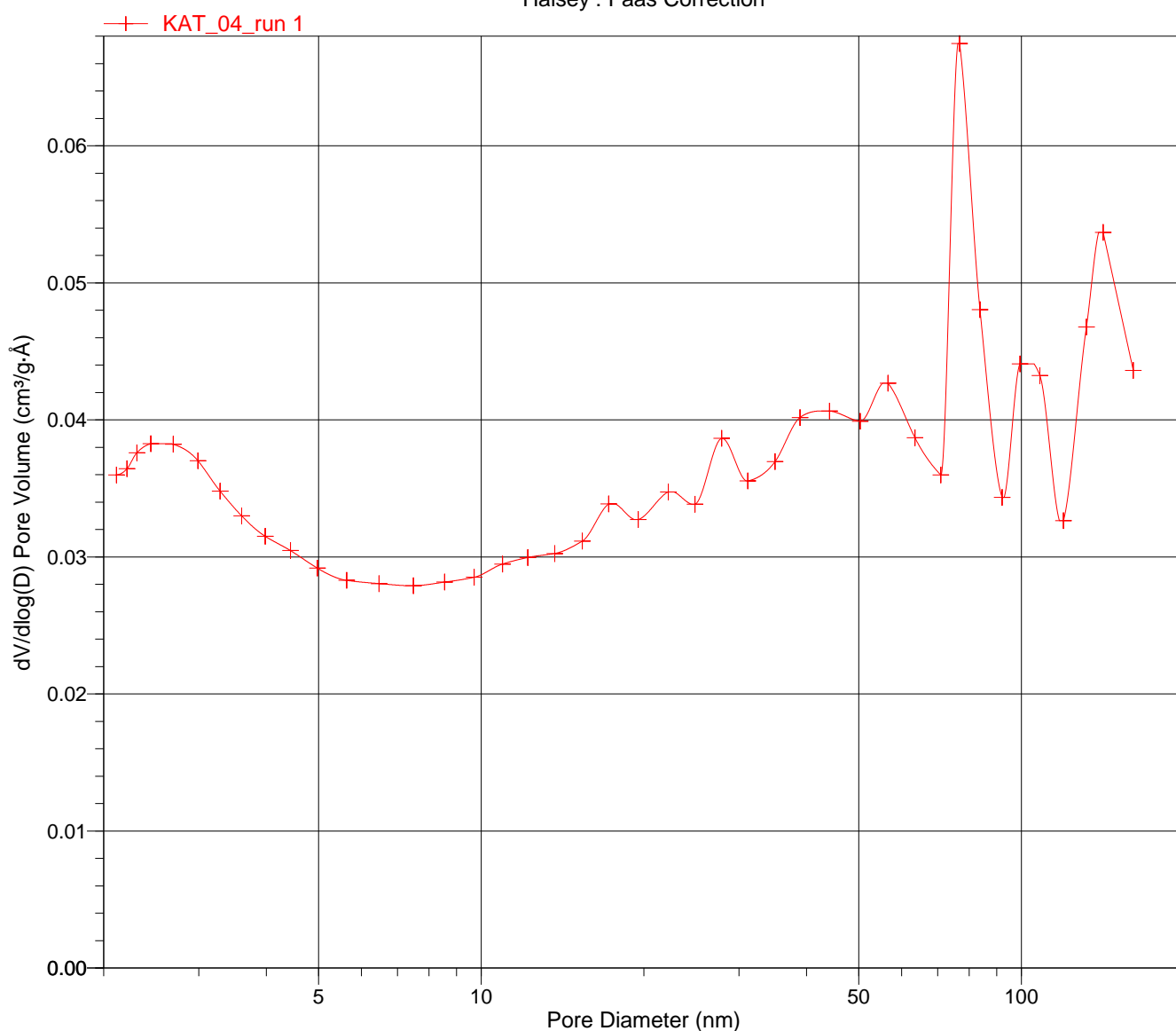
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BJH Adsorption dV/dlog(D) Pore Volume

Halsey : Faas Correction



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BJH Desorption Reports

Primary Data

1045- Fewer than 2 points available for BJH Desorption calculations.
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File: C:\WIN3020\DATA\IPPT\KAT_01.SMP

Started: 28.07.2017 8:55:38	Analysis Adsorptive: N2
Completed: 28.07.2017 21:58:09	Analysis Bath Temp.: 77.350 K
Report Time: 31.07.2017 8:47:55	Sample Mass: 1.4442 g
Warm Free Space: 10.7690 cm ³ Measured	Cold Free Space: 30.9888 cm ³ Measured
Equilibration Interval: 10 s	Low Pressure Dose: None
Sample Density: 1.000 g/cm ³	Automatic Degas: No

Options Report

Sample Tube

Warm free space: 3.7700 cm³
Cold free space: 3.7700 cm³
Non-ideality factor: 0.0000620
Use Isothermal Jacket: Yes
Use Filler Rod: No
Vacuum seal type: None

Analysis Conditions

Preparation

Fast evacuation: No
Evacuation rate: 5.0 mmHg/s
Unrestricted evacuation from: 5.0 mmHg
Evacuation time: 0.50 h
Leak test: Yes
Leak test duration: 120 s
Use TranSeal: No

Free Space

Free-space type: Measured
Lower dewar for evacuation: Yes
Evacuation time: 0.30 h
Outgas test: Yes
Outgas test duration: 60 s

p° and Temperature

p° and T type: Measure p° in the p° tube for each isotherm point. Enter the Analysis Bath Temperature below.
Temperature: 77.350 K

Dosing

Use first pressure fixed dose: No
Use maximum volume increment: No
Target tolerance: 5.0% or 5.000 mmHg

Equilibration

Equilibration interval: 10 s
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
Maximum manifold pressure: 1050.00 mmHg
Non-ideality factor: 0.0000620
Density conversion factor: 0.0015468
Molecular cross-sectional area: 0.162 nm²