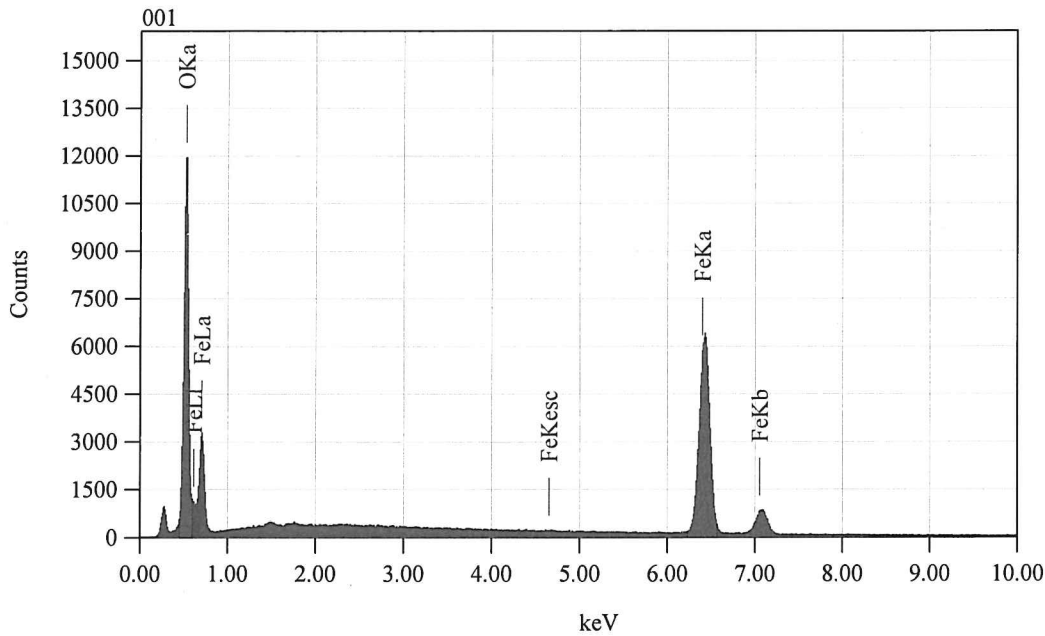


Title	: IMG1
Instrument	: JCM-6000
Volt	: 15.00 kV
Mag.	: x 800
Date	: 2021/05/28
Pixel	: 512 x 384



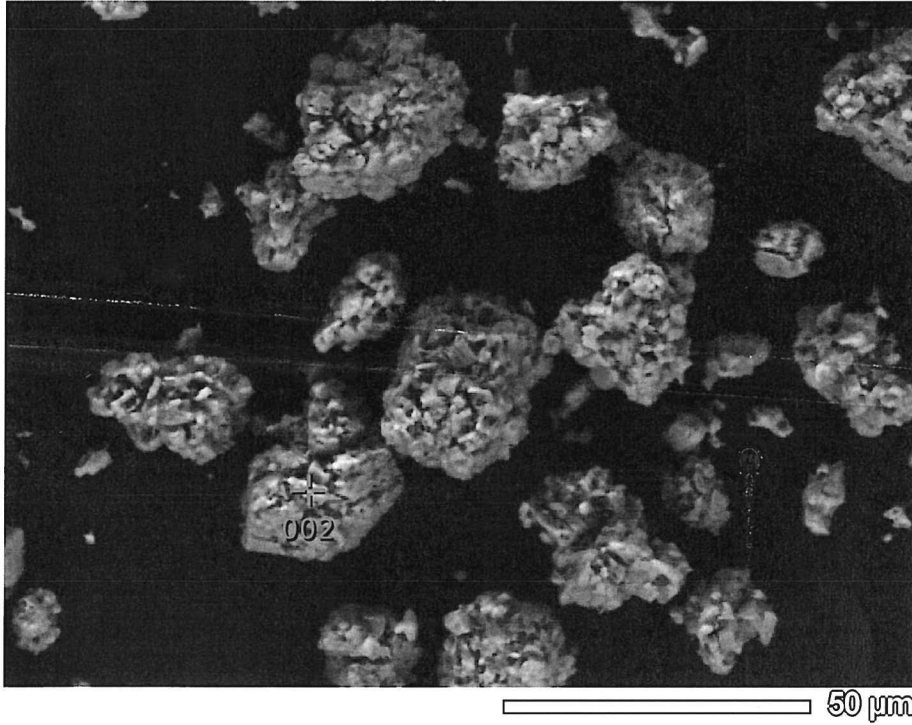
Acquisition Parameter	
Instrument	: JCM-6000
Acc. Voltage	: 15.0 kV
Probe Current	: 1.00000 nA
PHA mode	: T3
Real Time	: 33.84 sec
Live Time	: 30.00 sec
Dead Time	: 11 %
Counting Rate	: 13792 cps
Energy Range	: 0 - 20 keV

ZAF Method Standardless Quantitative Analysis

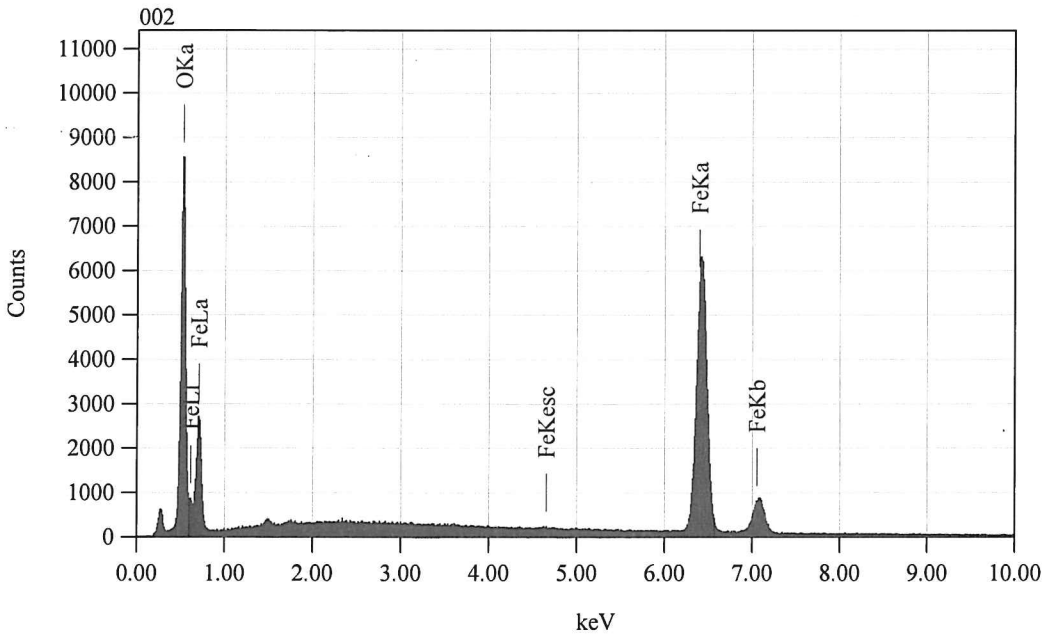
Fitting Coefficient : 0.2156

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
O K	0.525	46.31	0.12	75.07				44.7367
Fe K	6.398	53.69	0.19	24.93				55.2633
Total		100.00		100.00				

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Rev 2021-05-28



Title : IMG1
 Instrument : JCM-6000
 Volt : 15.00 kV
 Mag. : x 800
 Date : 2021/05/28
 Pixel : 512 x 384



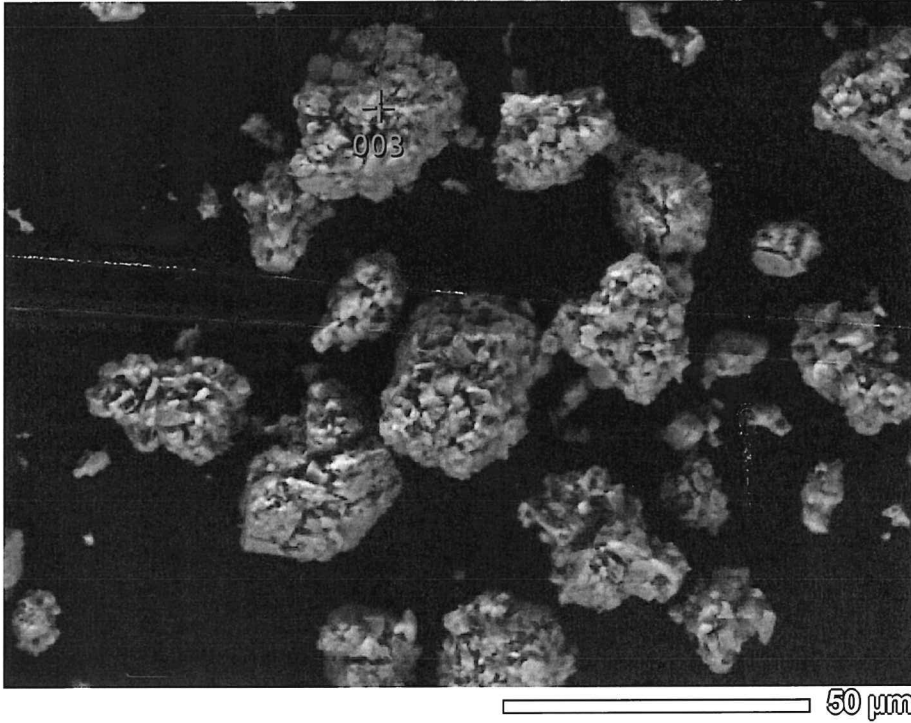
Acquisition Parameter
 Instrument : JCM-6000
 Acc. Voltage : 15.0 kV
 Probe Current: 1.00000 nA
 PHA mode : T3
 Real Time : 33.34 sec
 Live Time : 30.00 sec
 Dead Time : 9 %
 Counting Rate: 12171 cps
 Energy Range : 0 - 20 keV

ZAF Method Standardless Quantitative Analysis

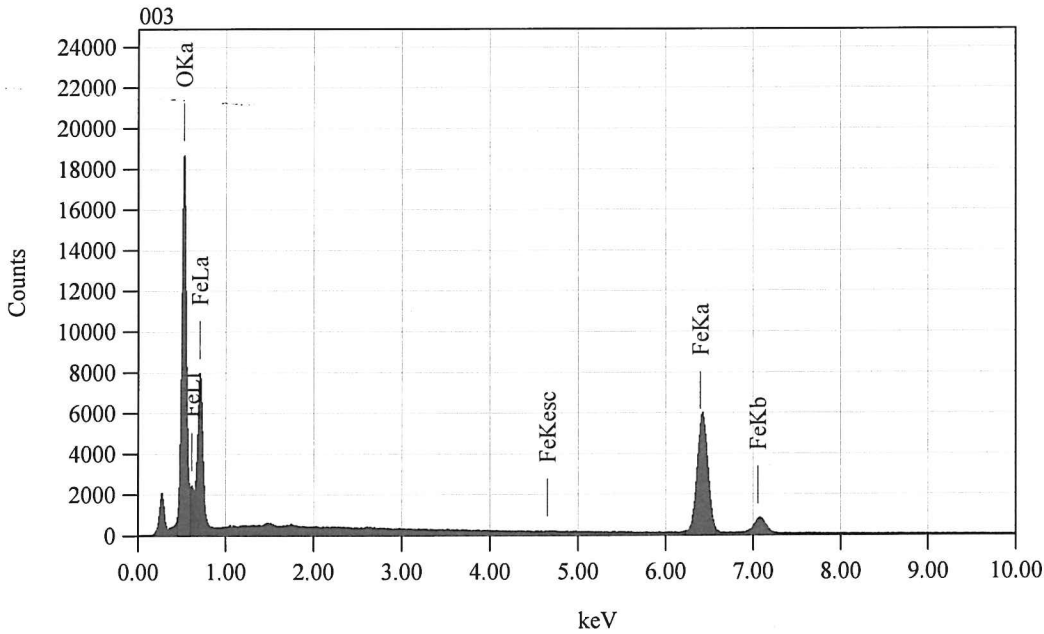
Fitting Coefficient : 0.2196

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
O K	0.525	39.44	0.12	69.45				36.7617
Fe K	6.398	60.56	0.21	30.55				63.2383
Total		100.00		100.00				

BS 2021-05-28
 Recd 2021-05-28



Title : IMG1
 Instrument : JCM-6000
 Volt : 15.00 kV
 Mag. : x 800
 Date : 2021/05/28
 Pixel : 512 x 384



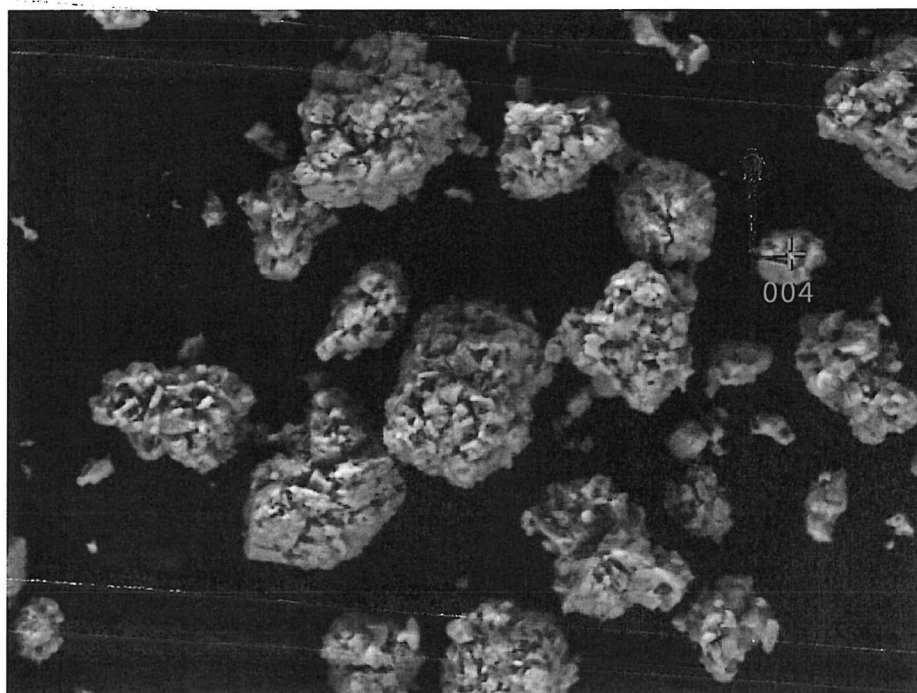
Acquisition Parameter
 Instrument : JCM-6000
 Acc. Voltage : 15.0 kV
 Probe Current: 1.00000 nA
 PHA mode : T3
 Real Time : 34.76 sec
 Live Time : 30.00 sec
 Dead Time : 13 %
 Counting Rate: 17422 cps
 Energy Range : 0 - 20 keV

ZAF Method Standardless Quantitative Analysis

Fitting Coefficient : 0.1940

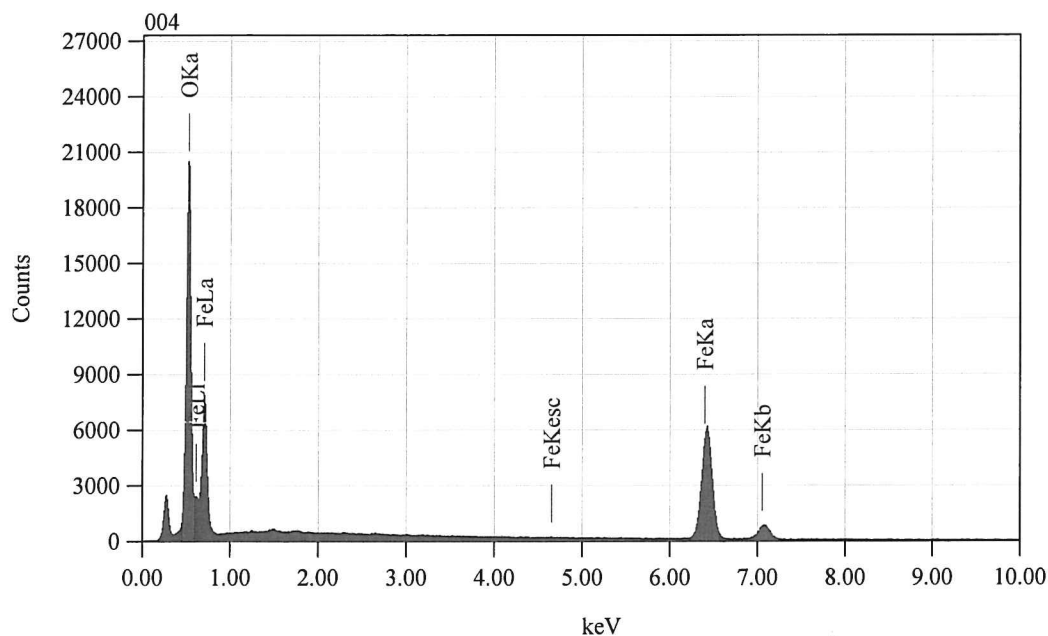
Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
O K	0.525	56.80	0.12	82.11				57.3473
Fe K	6.398	43.20	0.15	17.89				42.6527
Total		100.00		100.00				

BS 2021-05-28
 Rev 2021-05-28



Title : IMG1
 Instrument : JCM-6000
 Volt : 15.00 kV
 Mag. : x 800
 Date : 2021/05/28
 Pixel : 512 x 384

50 μm



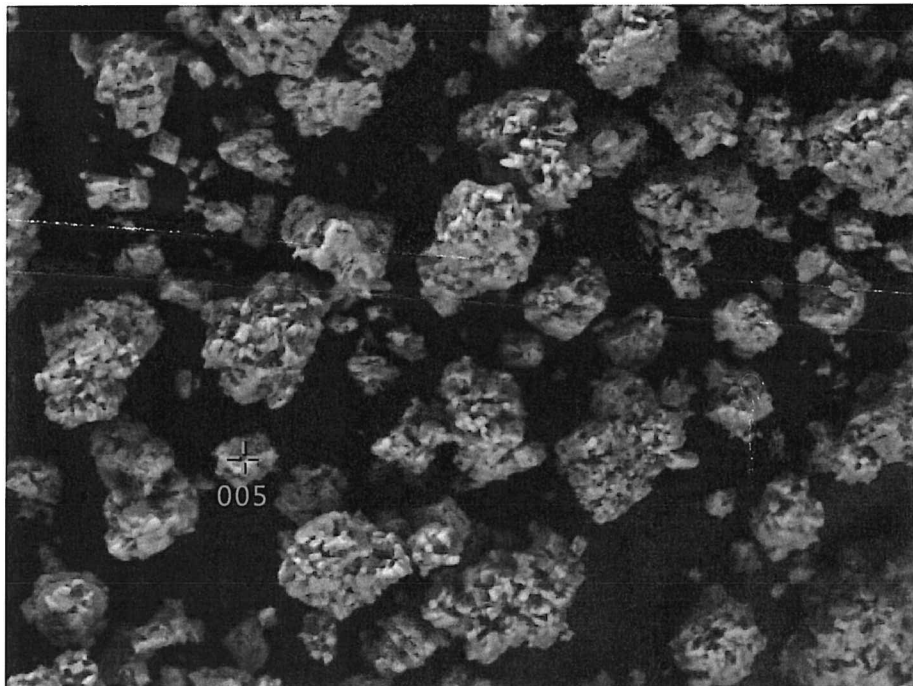
Acquisition Parameter
 Instrument : JCM-6000
 Acc. Voltage : 15.0 kV
 Probe Current: 1.00000 nA
 PHA mode : T3
 Real Time : 35.01 sec
 Live Time : 30.00 sec
 Dead Time : 14 %
 Counting Rate: 18352 cps
 Energy Range : 0 - 20 keV

ZAF Method Standardless Quantitative Analysis

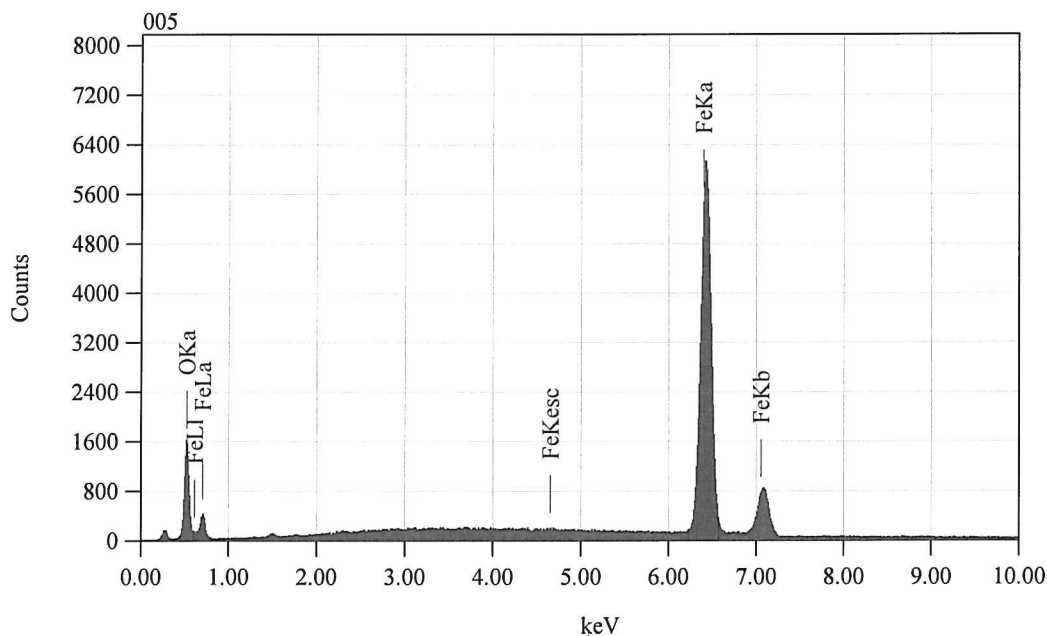
Fitting Coefficient : 0.1975

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
O K	0.525	58.34	0.12	83.02				59.2089
Fe K	6.398	41.66	0.15	16.98				40.7911
Total		100.00		100.00				

BS 2021-05-28
 2021-05-28



Title : IMG1
 Instrument : JCM-6000
 Volt : 15.00 kV
 Mag. : x 750
 Date : 2021/05/28
 Pixel : 512 x 384



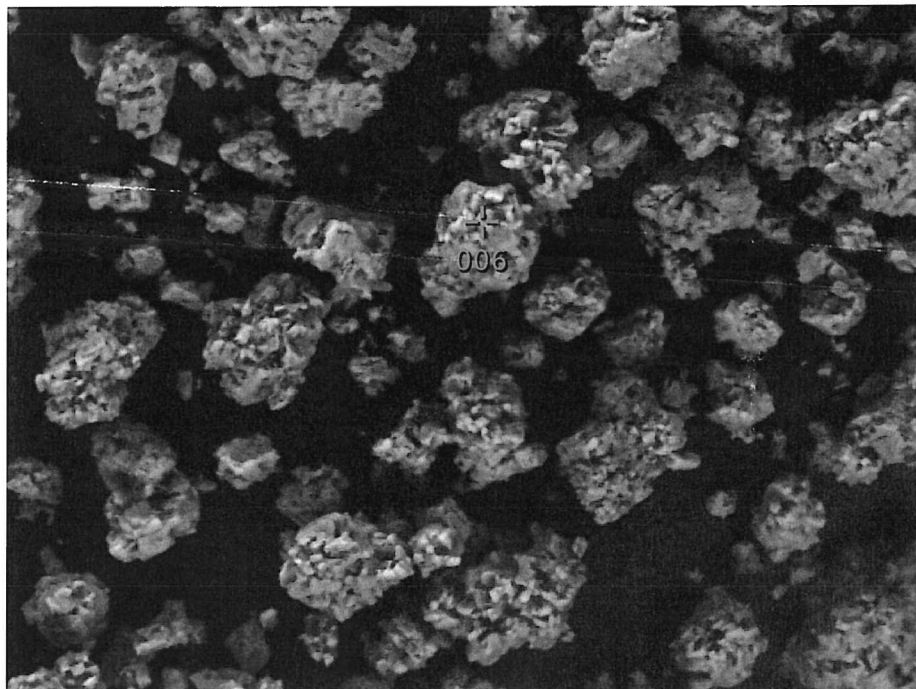
Acquisition Parameter
 Instrument : JCM-6000
 Acc. Voltage : 15.0 kV
 Probe Current: 1.00000 nA
 PHA mode : T3
 Real Time : 32.14 sec
 Live Time : 30.00 sec
 Dead Time : 6 %
 Counting Rate: 7493 cps
 Energy Range : 0 - 20 keV

ZAF Method Standardless Quantitative Analysis

Fitting Coefficient : 0.3053

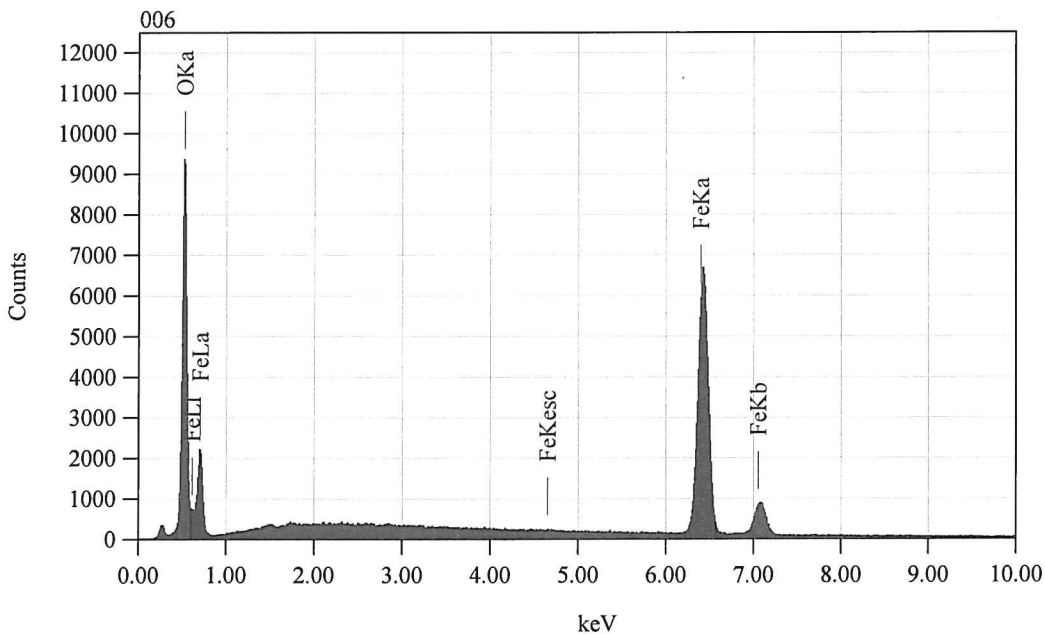
Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
O K	0.525	13.15	0.10	34.58				10.4506
Fe K*	6.398	86.85	0.31	65.42				89.5494
Total		100.00		100.00				

052021-05-28
 Rev 2021-05-28



Title : IMG1
 Instrument : JCM-6000
 Volt : 15.00 kV
 Mag. : x 750
 Date : 2021/05/28
 Pixel : 512 x 384

50 μm



Acquisition Parameter
 Instrument : JCM-6000
 Acc. Voltage : 15.0 kV
 Probe Current: 1.00000 nA
 PHA mode : T3
 Real Time : 33.50 sec
 Live Time : 30.00 sec
 Dead Time : 10 %
 Counting Rate: 12605 cps
 Energy Range : 0 - 20 keV

ZAF Method Standardless Quantitative Analysis

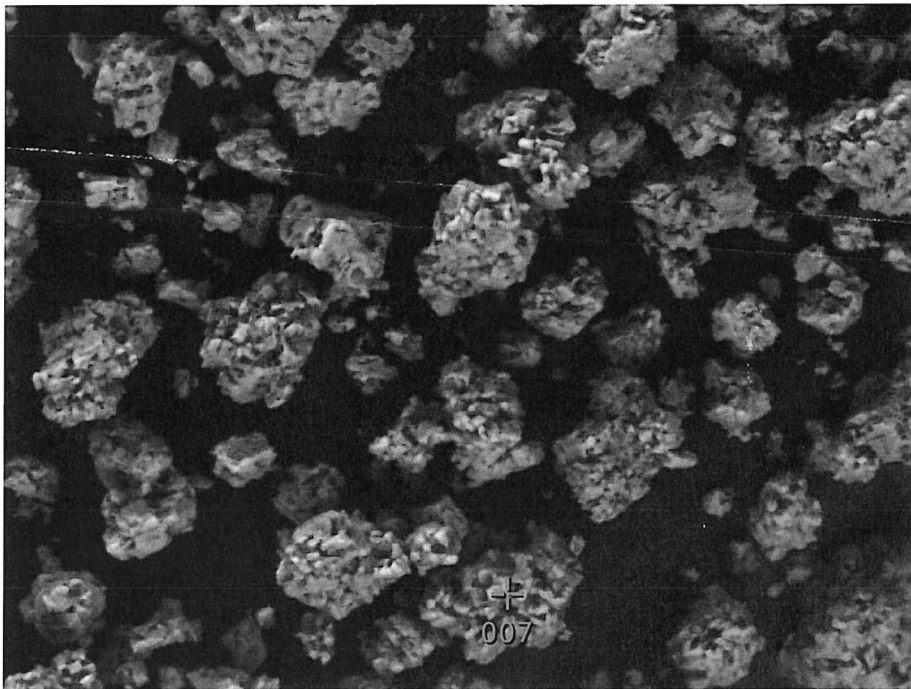
Fitting Coefficient : 0.2288

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
O K	0.525	40.66	0.12	70.51				38.1519
Fe K	6.398	59.34	0.20	29.49				61.8481
Total		100.00		100.00				

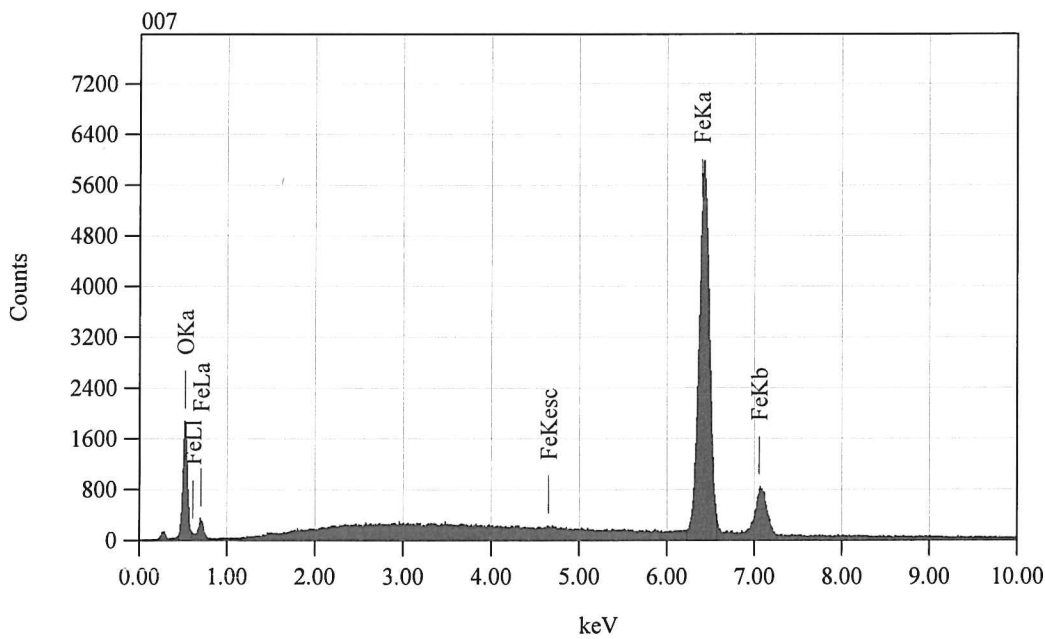
BS 2021-05-28

BS 2021-05-28

2021-05-28



Title : IMG1
 Instrument : JCM-6000
 Volt : 15.00 kV
 Mag. : x 750
 Date : 2021/05/28
 Pixel : 512 x 384



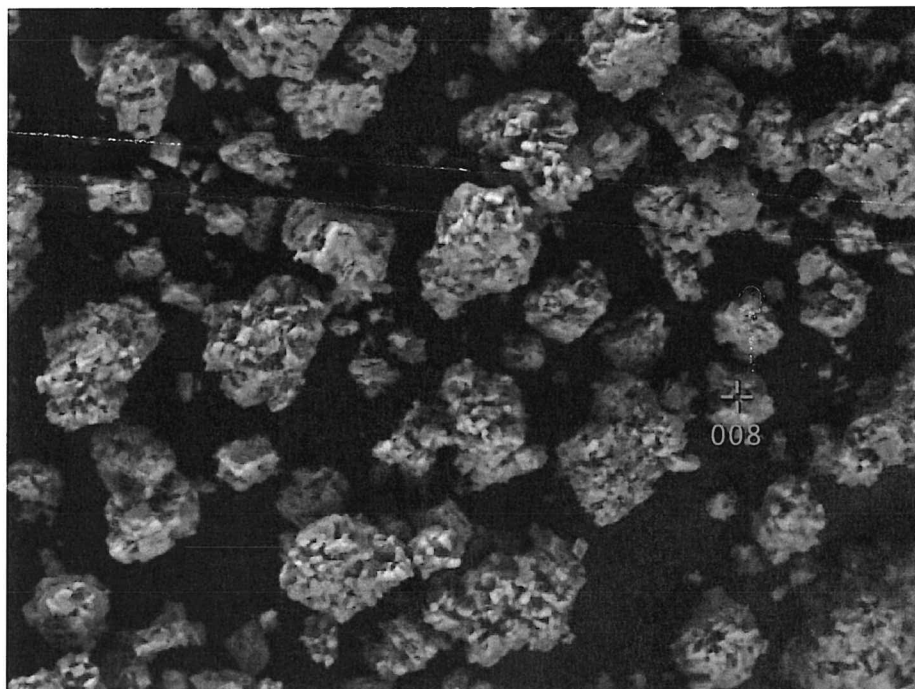
Acquisition Parameter
 Instrument : JCM-6000
 Acc. Voltage : 15.0 kV
 Probe Current: 1.00000 nA
 PHA mode : T3
 Real Time : 32.30 sec
 Live Time : 30.00 sec
 Dead Time : 7 %
 Counting Rate: 8124 cps
 Energy Range : 0 - 20 keV

ZAF Method Standardless Quantitative Analysis

Fitting Coefficient : 0.2967

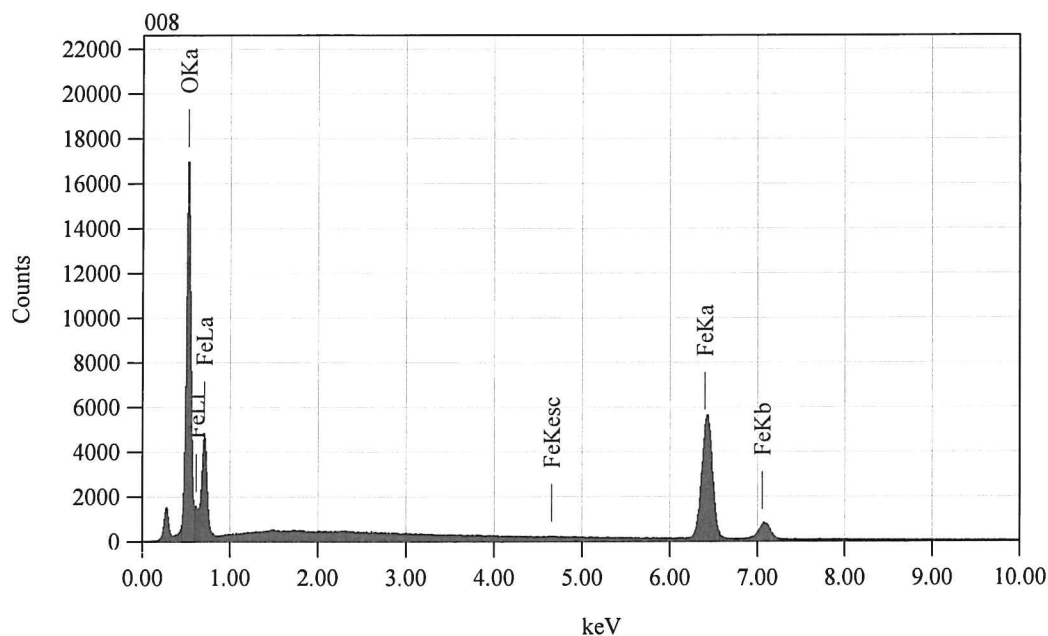
Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
O K	0.525	15.35	0.10	38.76				12.3631
Fe K*	6.398	84.65	0.31	61.24				87.6369
Total		100.00		100.00				

05-2021-05-28
 Full 2021-05-28



Title : IMG1
 Instrument : JCM-6000
 Volt : 15.00 kV
 Mag. : x 750
 Date : 2021/05/28
 Pixel : 512 x 384

50 μm



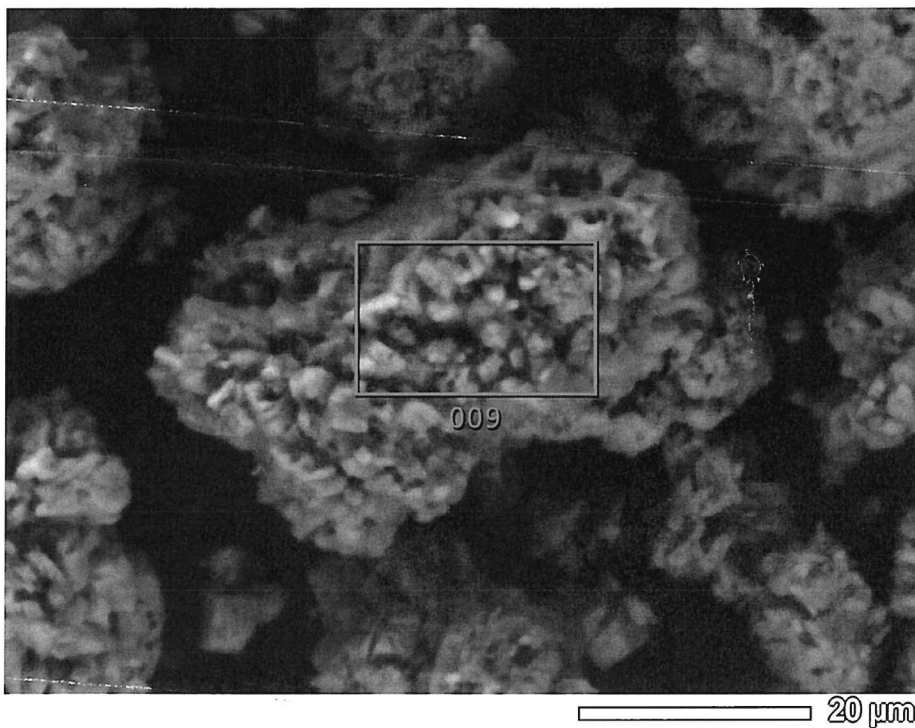
Acquisition Parameter
 Instrument : JCM-6000
 Acc. Voltage : 15.0 kV
 Probe Current : 1.00000 nA
 PHA mode : T3
 Real Time : 34.24 sec
 Live Time : 30.00 sec
 Dead Time : 12 %
 Counting Rate : 15611 cps
 Energy Range : 0 - 20 keV

ZAF Method Standardless Quantitative Analysis

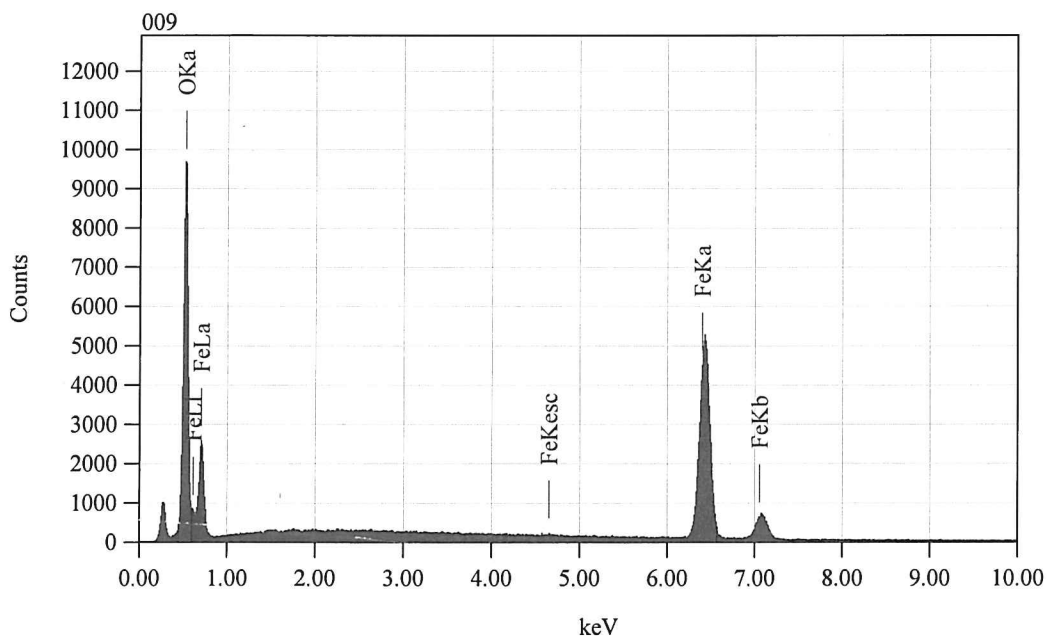
Fitting Coefficient : 0.2102

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
O K	0.525	56.48	0.13	81.92				56.9610
Fe K*	6.398	43.52	0.16	18.08				43.0390
Total		100.00		100.00				

BS 2021-05-28
 2021-05-28



Title : IMG1
 Instrument : JCM-6000
 Volt : 15.00 kV
 Mag. : x 1,500
 Date : 2021/05/28
 Pixel : 512 x 384



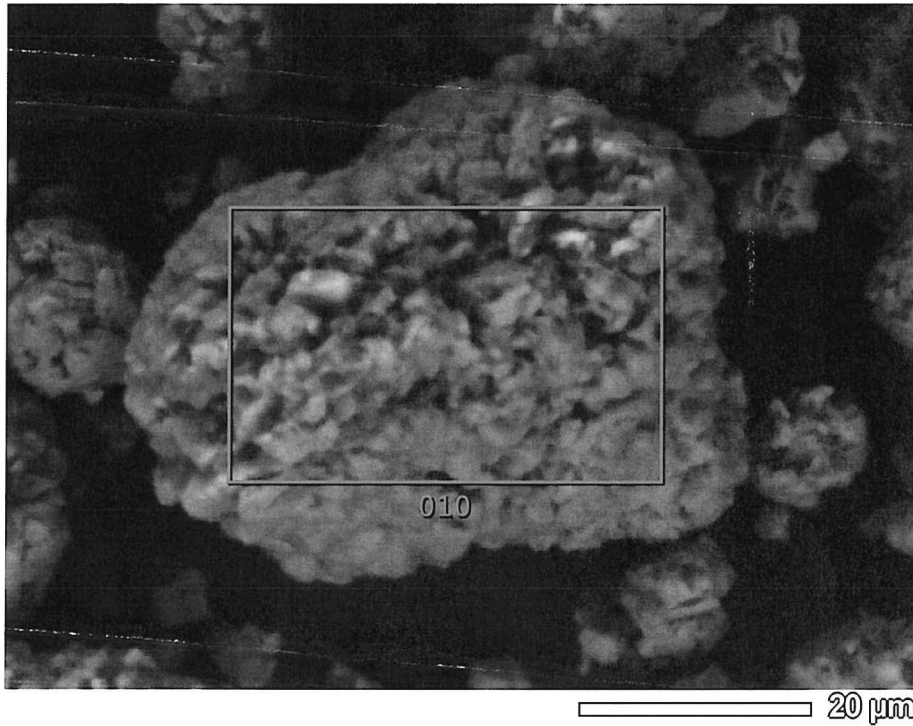
Acquisition Parameter
 Instrument : JCM-6000
 Acc. Voltage : 15.0 kV
 Probe Current: 1.00000 nA
 PHA mode : T3
 Real Time : 33.05 sec
 Live Time : 30.00 sec
 Dead Time : 8 %
 Counting Rate: 10488 cps
 Energy Range : 0 - 20 keV

ZAF Method Standardless Quantitative Analysis

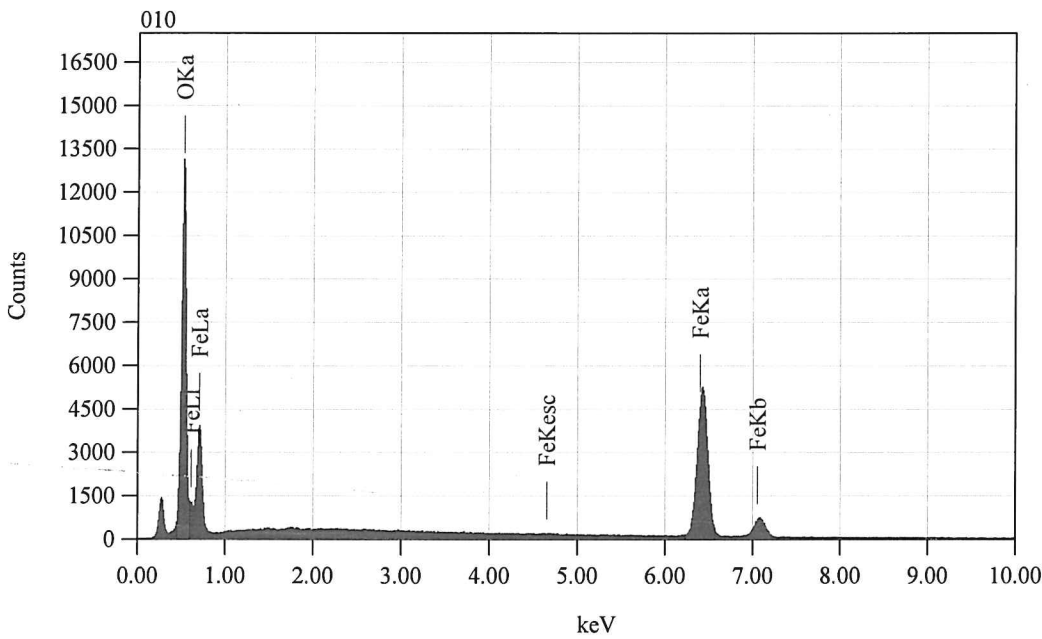
Fitting Coefficient : 0.2594

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
O K	0.525	47.65	0.14	76.06				46.3250
Fe K*	6.398	52.35	0.21	23.94				53.6750
Total		100.00		100.00				

BS2021-05-28
 2021-05-28



Title : IMG1
 Instrument : JCM-6000
 Volt : 15.00 kV
 Mag. : x 1,500
 Date : 2021/05/28
 Pixel : 512 x 384



Acquisition Parameter
 Instrument : JCM-6000
 Acc. Voltage : 15.0 kV
 Probe Current: 1.00000 nA
 PHA mode : T3
 Real Time : 33.56 sec
 Live Time : 30.00 sec
 Dead Time : 9 %
 Counting Rate: 11802 cps
 Energy Range : 0 - 20 keV

ZAF Method Standardless Quantitative Analysis

Fitting Coefficient : 0.2465

Element	(keV)	Mass%	Sigma	Atom%	Compound	Mass%	Cation	K
O K	0.525	53.48	0.14	80.05				53.3236
Fe K*	6.398	46.52	0.18	19.95				46.6764
Total		100.00		100.00				

BS 2021-05-28
 2021-05-28



Particle Technology Labs

LASER DIFFRACTION



Particle Technology Labs

INTERPRETING YOUR MALVERN FINE PARTICLE ANALYSIS

INTRODUCTION

The particle size analysis of your sample(s) has been conducted on a Malvern® MasterSizer LASER diffractor. This instrument is considered an ensemble analyzer that calculates a volume distribution from the LASER (Light Amplification by Stimulated Emission of Radiation) diffraction pattern of a suspension of particles. This raw scatter data are then processed using a complex algorithm and presented on the basis of **EQUIVALENT SPHERICAL DIAMETER**. The Malvern equipment currently in use at Particle Technology Labs (PTL) are the *MasterSizer 2000 and the MasterSizer 3000*.

THE DATA

The header section contains various user-entered information including client name, sample identification, and analysis notes. Each project submitted to PTL is given a unique seven digit code (PTL Project #) which can be found on these data pages, although its location is dependent on the instrumentation used. On the MasterSizer 2000 and 3000 data, the PTL Project # appears at the bottom of the page and is identified as File Name or within the File. Please refer to this PTL Project # when contacting us with any questions regarding the analysis.

The data output also provides the parameters specific to the instrument being used, as well as the parameters specific to the analysis. The optical model (composed of the sample's refractive index as well as the imaginary absorption value) is required if determining the particle size using Mie theory. This theory can be used on any size particles, but is specifically recommended over the use of the Fraunhofer approximation according to ISO 13320:2020 for material in the size region less than approximately 50 µm. Please note that, unless otherwise requested or provided by the client, the analysis of an unknown material is generally conducted using the standard instrument default optical values as detailed below.

SYSTEM DEFAULT VALUES

SETTINGS	MASTERSIZER 2000 / MASTERSIZER 3000	
	WET	DRY
Analysis Model	General Purpose	General Purpose
Presentation	Default	Default
Sample RI Value	1.520	1.520

The Fraunhofer approximation, which does not require specific knowledge of the optical properties of the sample, can be applied for large particles if a known refractive index of the material is not available or the sample is composed of multiple components. If the actual RI of the sample material is provided at a later date, the raw data can be recalculated to adjust for the refractive index.

Please note the following commonly reported values when reviewing your data:

- **TABULATED DATA:** ALWAYS appears as a Cumulative % less than (*Volume Under %*) unless otherwise requested.
- **SPAN:** Value related to the width of the curve, expressed as $\frac{Dv(90) - Dv(10)}{Dv(50)}$ or $\frac{d(0.9) - d(0.1)}{d(0.5)}$ depending on the instrument.
- **D[3,2]:** Surface-weighted mean diameter (Sauter diameter)
- **D[4,3]:** Volume-weighted MEAN
- **10%, 50%, 90% size values:** Indicates the size median which 10%, 50%, or 90% of the particles within the distribution is smaller than (example: Dv(90) or d(0.9): 140 µm, this means that 90% of the particulate is smaller than 140 µm on a volume basis).
- **Specific Surface Area:** If a calculated Specific Surface Area value is reported, consider this value only as an approximate surface area since calculations are based upon **non-porous spheres**. It is not a replacement for a result produced from an actual gas adsorption instrument due to the above assumption.

Also included is the Particle Size Distribution **DIFFERENTIAL HISTOGRAM**. This histogram shows the Tabulated Data as a **Differential Volume Percent Less Than Indicated Size**. Please note that the histogram for the *MasterSizer 3000* also generally includes a CUMULATIVE Curve representative of the Tabulated Data.

For additional questions specific to your sample results, please contact us directly.

Malvern 3000 Liquid Analysis v.2

Measurement Details

Client ENGINEERED DATA, LLC
Test Method N/A
Operator Name bsprys
SOP File Name HydroMV.cfg
Carrier Non-Aqueous
Notes N/A

Measurement Details

Sample Name Average of 'Nanoporous Iron Oxide (Fe2O3)'
Sample ID 05-15-2021
PTL ID 485850-70
Analysis Date Time 5/27/2021 9:40:28 AM
Measurement Date 5/27/2021 9:40:28 AM
Time
Result Source Averaged

Analysis

Particle Name Iron III Oxide Fe2O3
Particle Refractive Index 2.918
Particle Absorption Index 1.000
Weighted Residual 0.45 %
Laser Power 76.65 %
Laser Obscuration 10.59 %
Accessory Name Hydro MV
Software Version 3.72.1810.240

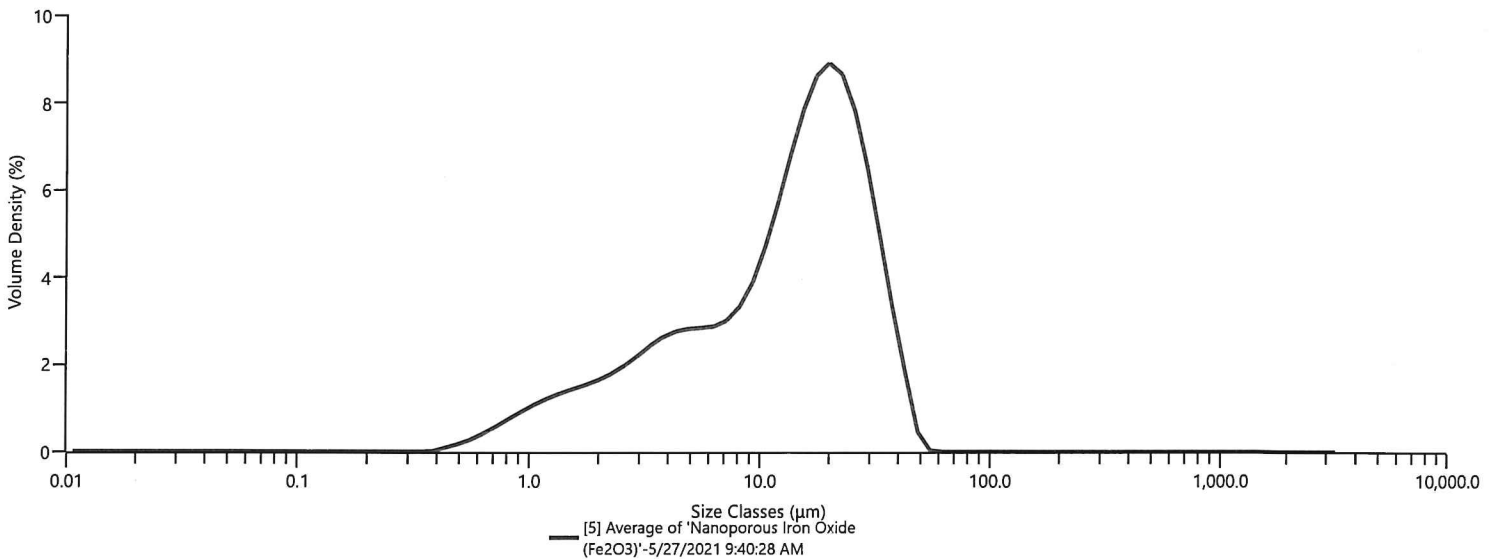
Result

Dispersant Name In House Hydrocarbon
Dispersant Refractive Index 1.420
Analysis Model General Purpose
Analysis Sensitivity Normal
Are particles non-spherical? Yes
Scattering Model Mie
Accessory Serial No. MAL1211922
Instrument Serial No. MAL1220065
Virtual Lens Range

Dv (10) 2.22 µm
Dv (50) 14.2 µm
Dv (90) 30.1 µm

D [4,3] 15.2 µm
Span 1.969

Frequency (compatible)



Measurement Details

File Path R:\Malvern 3000\Measurement Data\51416-70.mmes
Record Number 5
Average Result Records 1, 2, 3, 4

BS 2021-05-28
 JL 2021-05-28

Malvern 3000 Liquid Analysis v.2



Measurement Details	Measurement Details
Client ENGINEERED DATA, LLC Test Method N/A Operator Name bsprys SOP File Name HydroMV.cfg Carrier Non-Aqueous Notes N/A	Sample Name Average of 'Nanoporous Iron Oxide (Fe2O3)' Sample ID 05-15-2021 PTL ID 485850-70 Analysis Date Time 5/27/2021 9:40:28 AM Measurement Date Time 5/27/2021 9:40:28 AM Result Source Averaged

Result									
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.166	0.00	2.75	12.66	45.6	99.69	756	100.00
0.0114	0.00	0.188	0.00	3.12	14.49	51.8	100.00	859	100.00
0.0129	0.00	0.214	0.00	3.55	16.51	58.9	100.00	976	100.00
0.0147	0.00	0.243	0.00	4.03	18.70	66.9	100.00	1110	100.00
0.0167	0.00	0.276	0.00	4.58	21.00	76.0	100.00	1260	100.00
0.0189	0.00	0.314	0.00	5.21	23.35	86.4	100.00	1430	100.00
0.0215	0.00	0.357	0.00	5.92	25.72	98.1	100.00	1630	100.00
0.0244	0.00	0.405	0.00	6.72	28.11	111	100.00	1850	100.00
0.0278	0.00	0.460	0.08	7.64	30.60	127	100.00	2100	100.00
0.0315	0.00	0.523	0.22	8.68	33.35	144	100.00	2390	100.00
0.0358	0.00	0.594	0.44	9.86	36.56	163	100.00	2710	100.00
0.0407	0.00	0.675	0.79	11.2	40.45	186	100.00	3080	100.00
0.0463	0.00	0.767	1.27	12.7	45.19	211	100.00	3500	100.00
0.0526	0.00	0.872	1.89	14.5	50.87	240	100.00		
0.0597	0.00	0.991	2.66	16.4	57.43	272	100.00		
0.0679	0.00	1.13	3.56	18.7	64.63	310	100.00		
0.0771	0.00	1.28	4.58	21.2	72.10	352	100.00		
0.0876	0.00	1.45	5.69	24.1	79.35	400	100.00		
0.0995	0.00	1.65	6.89	27.4	85.91	454	100.00		
0.113	0.00	1.88	8.17	31.1	91.36	516	100.00		
0.128	0.00	2.13	9.54	35.3	95.46	586	100.00		
0.146	0.00	2.42	11.02	40.1	98.18	666	100.00		

Measurement Details
File Path R:\Malvern 3000\Measurement Data\51416-70.mmes Record Number 5 Average Result Records 1, 2, 3, 4





Particle Technology Labs

GAS ADSORPTION

A:Q Micropore-Mesopore

Isotherm



GAS PHYSISORPTION ISOTHERM DEGASSING CONDITIONS

SAMPLE ID	EXTERNAL DEGASSING CONDITIONS		
	DURATION	TEMPERATURE	TECHNIQUE
Nanoporous Iron Oxide (Fe ₂ O ₃)			
05-15-2021	18 Hours	100°C	Vacuum

GAS PHYSISORPTION ISOTHERM DATA SUMMARY

SAMPLE ID	BET SPECIFIC SURFACE AREA (m ² /g)	BJH PORE VOLUME 1.7 – 300 nm (cm ³ /g)	BJH AVG PORE DIAMETER 1.7 – 300 nm (nm)	ADSORBATE GAS
Nanoporous Iron Oxide (Fe ₂ O ₃)				
05-15-2021	194.01	0.25	3.71	Nitrogen

GAS PHYSISORPTION ISOTHERM DATA SUMMARY (continued)

SAMPLE ID	DFT PORE VOLUME	DFT PORE AREA	
	TOTAL VOLUME (cm ³ /g)	TOTAL AREA (m ² /g)	PORE SIZE RANGE (nm)
Nanoporous Iron Oxide (Fe ₂ O ₃)			
05-15-2021	0.20	134.24	≥ 0.548

JF Davis
CR 2021.05.27



Particle Technology Labs

Analysis

Operator: JF
 Sample ID: 5141670A
 Sample Desc:
 Sample Weight: 0.1065 g
 Approx. Outgas Time: 18.1 hrs
 Analysis gas: Nitrogen
 Analysis Time: 16:00 hr:min
 Analysis Mode: Standard
 VVrm(1): v=0.487511 @ t=441.967
 VoidVol. Mode: He Measure

Date: 2021/05/26

Filename: 5141670A.qps
 Comment: 05-15-2021 Engineered Data, LLC 485850-70 51416-70
 Instrument: Autosorb iQ Station 1
 Final Outgas Temp.: 100 °C
 Non-ideality: 6.58e-05 1/Torr
 Bath temp.: 77.35 K
 VVrm(2): v=0.702254 @ t=960.05
 Cold Zone V: 5.02 cc

Report

Operator: JF Date: 2021/05/27

Extended info: Available
 CellType: 6mm w/o rod
 VoidVol Remeasure: on
 Warm Zone V: 8.47491 cc

MBET summary

Slope = 17.730 1/g
 Intercept = 2.197e-01 1/g
 Correlation coefficient, r = 0.999092
 C constant = 81.695
 Surface Area = 194.012 m²/g

BJH adsorption summary

Surface Area = 50.773 m²/g
 Pore Volume = 0.246 cc/g
 Pore Diameter Dv(d) = 2.970 nm

BJH desorption summary

Surface Area = 61.567 m²/g
 Pore Volume = 0.249 cc/g
 Pore Diameter Dv(d) = 3.708 nm

DFT method summary

Pore volume = 0.198 cc/g
 Surface area = 134.243 m²/g
 Lower confidence limit = 0.548 nm
 Fitting error = 1.958 %
 Pore width (Mode) = 1.410 nm
 Moving point average : off

Total Pore Volume data

Total Pore Volume

Total pore volume = 3.166e-01 cc/g for
 pores smaller than 333.9 nm (Diameter)
 at P/Po = 0.99423

Average PoreSize data

Average pore Diameter = 6.52793e+00 nm

JF Deane JF
COL 2021-05-27



Particle Technology Labs

Analysis

Operator: JF
Sample ID: 5141670A

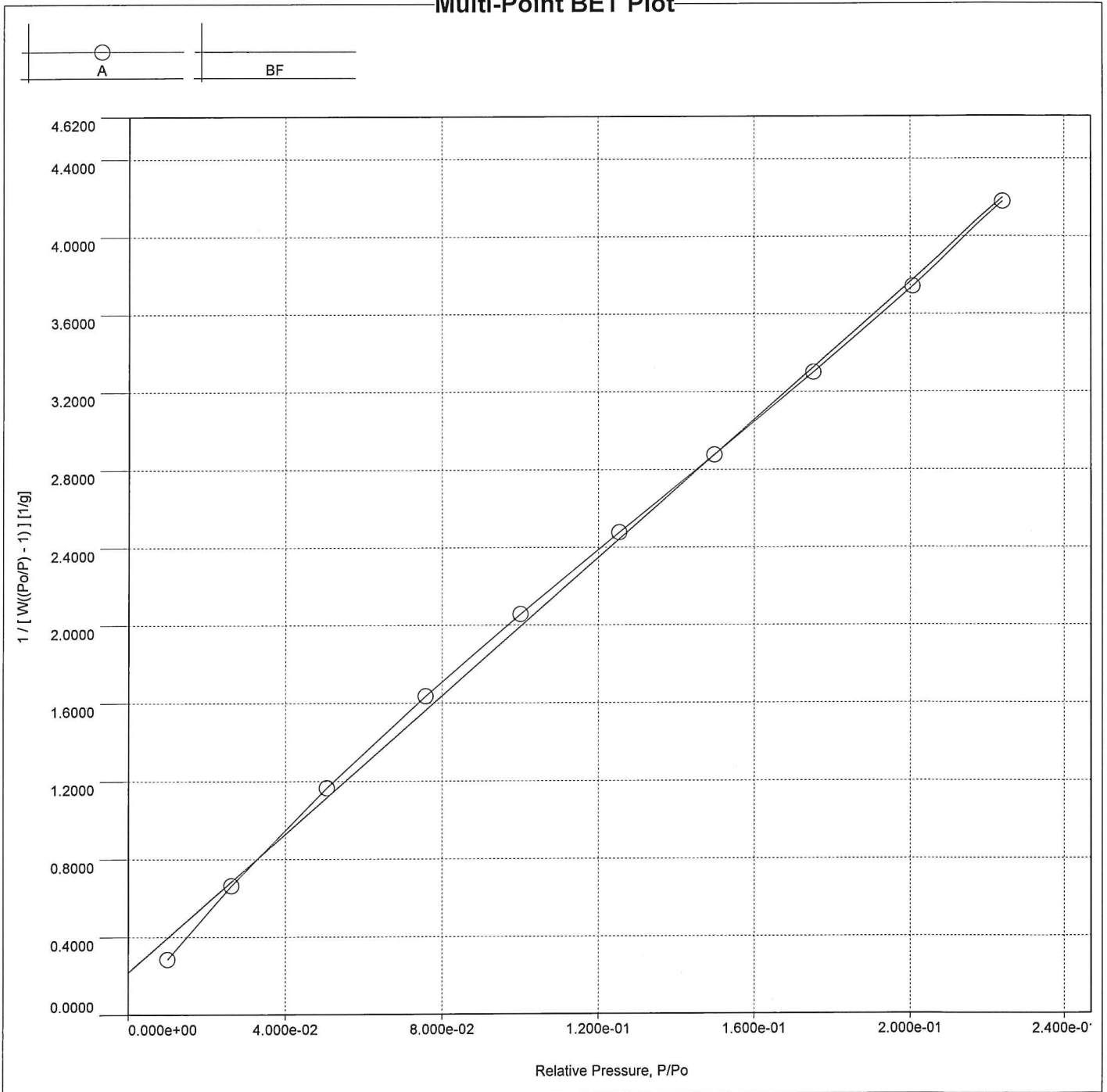
Date: 2021/05/26
Filename:

Report

Operator: JF
5141670A.qps

Date: 2021/05/27

Multi-Point BET Plot





Particle Technology Labs

Analysis

Operator: JF
 Sample ID: 5141670A

Date:2021/05/26
 Filename:

Report

Operator: JF
 5141670A.qps

Date:2021/05/27

Isotherm

Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]	Relative Pressure	Volume @ STP [cc/g]
1.07905e-06	0.8411	2.74657e-01	58.4184	8.75736e-01	102.7023
1.09906e-06	1.1214	2.99780e-01	59.6793	8.50152e-01	97.6376
1.14046e-06	1.4015	3.25092e-01	60.8650	8.25676e-01	93.8115
1.19704e-06	1.6815	3.50252e-01	61.9410	7.99735e-01	90.4733
1.26770e-06	1.9611	3.75546e-01	62.9786	7.75730e-01	87.9554
1.36666e-06	2.2407	4.00364e-01	63.9818	7.50585e-01	85.6351
1.47766e-06	2.5198	4.25663e-01	64.9349	7.25064e-01	83.6099
2.62794e-06	3.6461	4.50088e-01	66.0219	7.00391e-01	82.2072
4.69687e-06	4.7682	4.75331e-01	67.0093	6.75523e-01	80.6727
8.86503e-06	5.9504	5.00425e-01	67.9916	6.50651e-01	79.2692
8.86730e-06	5.9662	5.25742e-01	68.9434	6.25227e-01	77.8924
2.55225e-05	8.4223	5.50054e-01	69.8974	6.00196e-01	76.6123
4.62030e-05	10.1798	5.75316e-01	70.9035	5.75107e-01	75.4062
6.84602e-05	11.4065	6.00064e-01	71.9507	5.50017e-01	74.2259
8.71918e-05	12.2078	6.25187e-01	73.0398	5.24776e-01	73.1063
2.19087e-04	15.2966	6.49868e-01	74.2255	4.99846e-01	72.0015
4.46592e-04	17.7605	6.75060e-01	75.5269	4.75147e-01	70.7397
6.39354e-04	19.0185	6.99554e-01	76.9168	4.49669e-01	67.7542
8.22972e-04	19.9150	7.24378e-01	78.4560	4.25748e-01	66.1896
9.99833e-04	20.5956	7.49688e-01	80.6022	4.00102e-01	64.9290
3.26587e-03	24.5776	7.75125e-01	82.7043	3.74704e-01	63.7935
5.01760e-03	26.0020	7.99469e-01	84.9899	3.49350e-01	62.7801
7.13657e-03	27.1955	8.25184e-01	87.9671	3.24754e-01	61.6578
9.07412e-03	28.0382	8.49639e-01	91.3312	2.99854e-01	60.4503
1.00341e-02	28.4008	8.75323e-01	95.8795	2.75045e-01	59.1480
2.62434e-02	32.4593	8.99206e-01	101.1173	2.50232e-01	57.7240
5.05274e-02	36.5317	9.25505e-01	108.7583	2.25484e-01	56.1085
7.58184e-02	40.1394	9.50572e-01	118.9901	2.00831e-01	54.2669
1.00072e-01	43.2707	9.75082e-01	136.0176	1.74343e-01	51.9616
1.25394e-01	46.3185	9.94233e-01	204.6946	1.49624e-01	49.5146
1.49803e-01	49.0285	9.93851e-01	204.6119	1.25025e-01	46.7696
1.75212e-01	51.5177	9.75687e-01	146.8736	1.00845e-01	43.8035
2.00662e-01	53.6820	9.50629e-01	124.9230	7.43755e-02	40.2808
2.24334e-01	55.4095	9.26214e-01	115.7182	4.94374e-02	36.6249
2.49303e-01	56.9855	8.99359e-01	108.0936	2.31790e-02	32.0161



Particle Technology Labs



Analysis

Operator: JF
Sample ID: 5141670A

Date: 2021/05/26

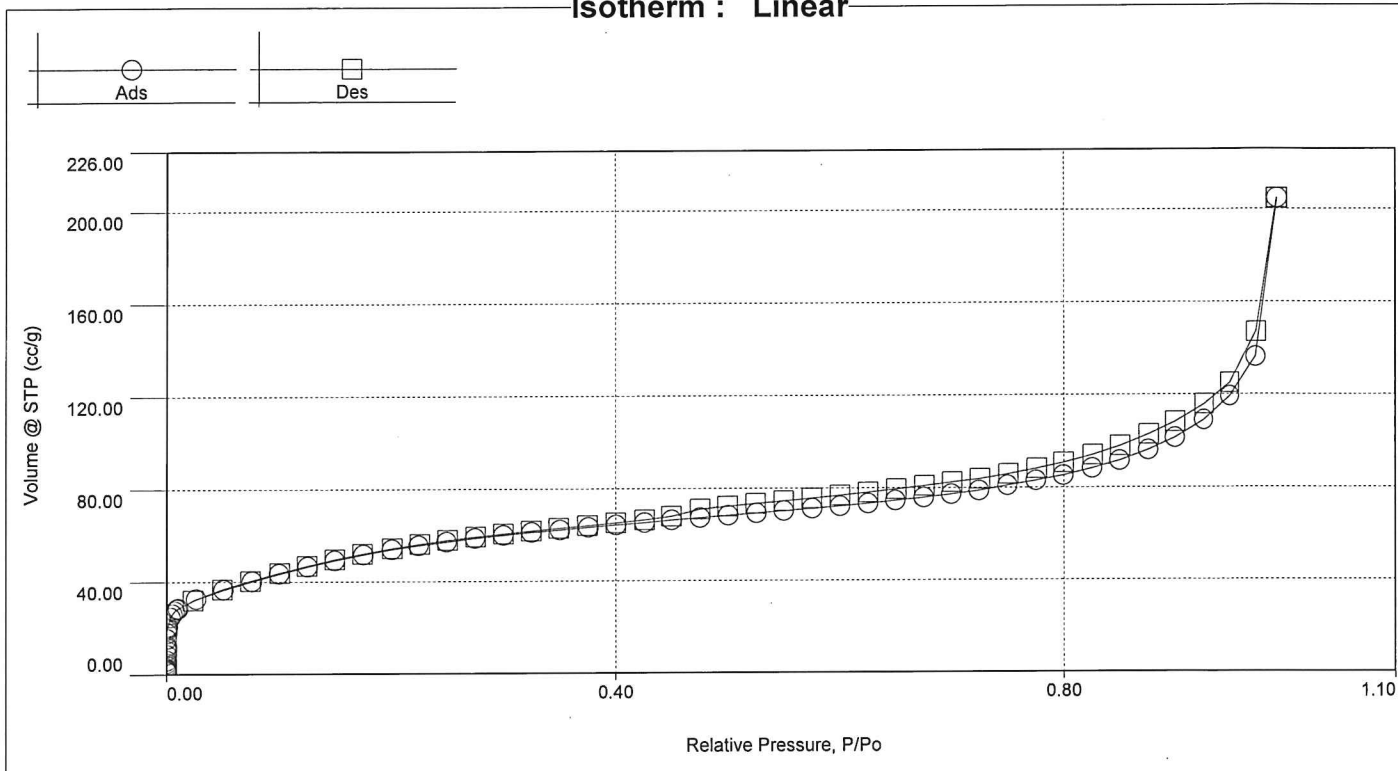
Filename:

Report

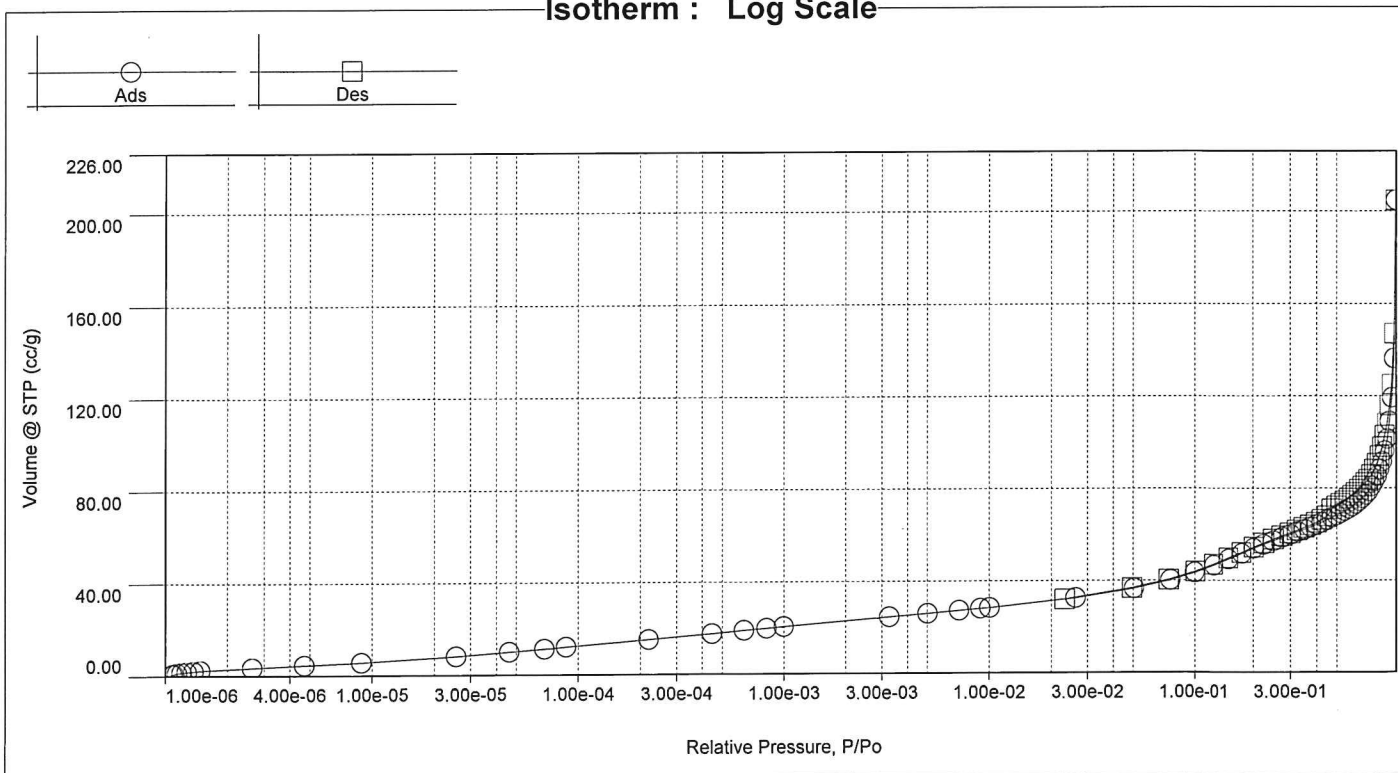
Operator: JF
5141670A.qps

Date: 2021/05/27

Isotherm : Linear



Isotherm : Log Scale





Particle Technology Labs

Analysis

Operator: JF
 Sample ID: 5141670A

Date:2021/05/26
 Filename:

Report

Operator: JF
 5141670A.qps

Date:2021/05/27

Adsorption

Diameter [nm]	Pore Volume [cc/g]	Pore Surf Area [m ² /g]	dV(d) [cc/nm/g]	dS(d) [m ² /nm/g]	dV(logd) [cc/g]	dS(logd) [cc/g]
2.9702	2.2333e-03	3.0076e+00	1.3602e-02	1.8318e+01	9.3003e-02	1.2525e+02
3.1379	4.3522e-03	5.7086e+00	1.2376e-02	1.5775e+01	8.9396e-02	1.1396e+02
3.3167	6.2298e-03	7.9729e+00	1.0074e-02	1.2149e+01	7.6914e-02	9.2759e+01
3.5064	8.6141e-03	1.0693e+01	1.2354e-02	1.4093e+01	9.9723e-02	1.1376e+02
3.7104	1.0564e-02	1.2795e+01	9.0711e-03	9.7790e+00	7.7477e-02	8.3524e+01
3.9338	1.2462e-02	1.4725e+01	8.1869e-03	8.3246e+00	7.4135e-02	7.5382e+01
4.1773	1.4195e-02	1.6384e+01	6.7915e-03	6.5033e+00	6.5304e-02	6.2533e+01
4.4390	1.5935e-02	1.7952e+01	6.4834e-03	5.8421e+00	6.6248e-02	5.9696e+01
4.7271	1.7728e-02	1.9470e+01	5.8293e-03	4.9327e+00	6.3427e-02	5.3671e+01
5.0483	1.9607e-02	2.0958e+01	5.6117e-03	4.4464e+00	6.5207e-02	5.1667e+01
5.4060	2.1518e-02	2.2372e+01	5.0204e-03	3.7147e+00	6.2467e-02	4.6220e+01
5.8075	2.3653e-02	2.3843e+01	5.0566e-03	3.4828e+00	6.7588e-02	4.6552e+01
6.2643	2.6000e-02	2.5342e+01	4.7755e-03	3.0493e+00	6.8847e-02	4.3961e+01
6.7855	2.8530e-02	2.6833e+01	4.5923e-03	2.7071e+00	7.1711e-02	4.2273e+01
7.3863	3.1334e-02	2.8351e+01	4.3084e-03	2.3332e+00	7.3228e-02	3.9656e+01
8.1056	3.5574e-02	3.0444e+01	5.3833e-03	2.6566e+00	1.0039e-01	4.9543e+01
8.9791	3.9544e-02	3.2212e+01	4.1381e-03	1.8435e+00	8.5475e-02	3.8077e+01
10.0255	4.3857e-02	3.3933e+01	3.8050e-03	1.5181e+00	8.7742e-02	3.5008e+01
11.3534	4.9549e-02	3.5939e+01	3.7390e-03	1.3173e+00	9.7598e-02	3.4386e+01
13.0688	5.5953e-02	3.7899e+01	3.3558e-03	1.0271e+00	1.0080e-01	3.0853e+01
15.4115	6.4615e-02	4.0147e+01	3.1191e-03	8.0954e-01	1.1038e-01	2.8650e+01
18.7024	7.4444e-02	4.2249e+01	2.5831e-03	5.5246e-01	1.1085e-01	2.3709e+01
24.0665	8.8486e-02	4.4583e+01	2.0284e-03	3.3713e-01	1.1162e-01	1.8553e+01
34.1679	1.0669e-01	4.6714e+01	1.3709e-03	1.6049e-01	1.0648e-01	1.2466e+01
59.9815	1.3561e-01	4.8643e+01	7.5420e-04	5.0295e-02	1.0051e-01	6.7030e+00
206.5129	2.4557e-01	5.0773e+01	4.3168e-04	8.3613e-03	1.7590e-01	3.4071e+00



Analysis

Operator: JF
Sample ID: 5141670A

Date:2021/05/26
Filename:

Report

Operator: JF
5141670A.qps

Date:2021/05/27

Desorption

Diameter	Pore Volume	Pore Surf Area	dV(d)	dS(d)	dV(logd)	dS(logd)
[nm]	[cc/g]	[m ² /g]	[cc/nm/g]	[m ² /nm/g]	[cc/g]	[cc/g]
3.1342	2.1461e-03	2.7389e+00	1.2265e-02	1.5654e+01	8.8494e-02	1.1294e+02
3.3161	4.7024e-03	5.8224e+00	1.3533e-02	1.6323e+01	1.0330e-01	1.2461e+02
3.5050	8.4567e-03	1.0107e+01	1.9873e-02	2.2679e+01	1.6035e-01	1.8299e+02
3.7079	1.7071e-02	1.9400e+01	3.9736e-02	4.2867e+01	3.3916e-01	3.6588e+02
3.9302	1.9808e-02	2.2185e+01	1.2010e-02	1.2223e+01	1.0866e-01	1.1059e+02
4.1694	2.1956e-02	2.4246e+01	8.5757e-03	8.2273e+00	8.2305e-02	7.8961e+01
4.4337	2.4075e-02	2.6158e+01	7.6166e-03	6.8715e+00	7.7733e-02	7.0129e+01
4.7255	2.6329e-02	2.8066e+01	7.3822e-03	6.2488e+00	8.0297e-02	6.7969e+01
5.0479	2.8591e-02	2.9858e+01	6.6637e-03	5.2804e+00	7.7424e-02	6.1351e+01
5.4073	3.0999e-02	3.1639e+01	6.3476e-03	4.6956e+00	7.9000e-02	5.8439e+01
5.8149	3.3580e-02	3.3415e+01	5.9218e-03	4.0735e+00	7.9253e-02	5.4517e+01
6.2763	3.6171e-02	3.5066e+01	5.3206e-03	3.3909e+00	7.6854e-02	4.8980e+01
6.8005	3.9019e-02	3.6742e+01	5.0745e-03	2.9848e+00	7.9415e-02	4.6711e+01
7.4062	4.1407e-02	3.8031e+01	3.6723e-03	1.9834e+00	6.2585e-02	3.3801e+01
8.1307	4.5243e-02	3.9918e+01	4.8028e-03	2.3628e+00	8.9843e-02	4.4200e+01
9.0071	4.9690e-02	4.1893e+01	4.6611e-03	2.0700e+00	9.6580e-02	4.2890e+01
10.0451	5.4512e-02	4.3813e+01	4.2981e-03	1.7115e+00	9.9309e-02	3.9545e+01
11.3770	6.0972e-02	4.6084e+01	4.1891e-03	1.4729e+00	1.0957e-01	3.8524e+01
13.1087	6.8367e-02	4.8341e+01	3.8488e-03	1.1744e+00	1.1596e-01	3.5385e+01
15.4616	7.8120e-02	5.0864e+01	3.5032e-03	9.0631e-01	1.2438e-01	3.2179e+01
18.7442	8.8267e-02	5.3030e+01	2.6834e-03	5.7264e-01	1.1542e-01	2.4631e+01
24.2081	1.0223e-01	5.5337e+01	1.9540e-03	3.2286e-01	1.0812e-01	1.7865e+01
34.3173	1.1851e-01	5.7234e+01	1.2453e-03	1.4515e-01	9.7202e-02	1.1330e+01
60.9627	1.5589e-01	5.9687e+01	9.2945e-04	6.0985e-02	1.2559e-01	8.2405e+00
197.1989	2.4850e-01	6.1566e+01	3.9872e-04	8.0876e-03	1.5772e-01	3.1993e+00
323.5982	2.4863e-01	6.1567e+01	6.3814e-06	7.8881e-05	4.7533e-03	5.8755e-02



Particle Technology Labs

Analysis
 Operator: JF
 Sample ID: 5141670A

Date:2021/05/26
 Filename:

Report
 Operator: JF
 5141670A.qps

Date:2021/05/27

Pore Size Distribution

Pore width [nm]	Cumulative Pore Volume [cc/g]	Cumulative Surface Area [m ² /g]	dV(d) [cc/nm/g]	dS(d) [m ² /nm/g]
0.5480	4.8715e-03	2.0601e+01	3.2030e-02	1.1690e+02
0.5732	5.7252e-03	2.3580e+01	3.3849e-02	1.1810e+02
0.5996	6.6067e-03	2.6520e+01	3.3410e-02	1.1144e+02
0.6272	7.4966e-03	2.9358e+01	3.2245e-02	1.0282e+02
0.6561	8.3643e-03	3.2003e+01	3.0056e-02	9.1626e+01
0.6863	9.2268e-03	3.4516e+01	2.8561e-02	8.3235e+01
0.7179	1.0099e-02	3.6945e+01	2.7598e-02	7.6891e+01
0.7509	1.0834e-02	3.8904e+01	2.2254e-02	5.9273e+01
0.7855	1.1320e-02	4.0141e+01	1.4063e-02	3.5810e+01
0.8216	1.1447e-02	4.0450e+01	3.5142e-03	8.5543e+00
0.8594	1.1447e-02	4.0450e+01	0.0000e+00	0.0000e+00
0.8990	1.1447e-02	4.0450e+01	0.0000e+00	0.0000e+00
0.9404	1.1447e-02	4.0450e+01	0.0000e+00	0.0000e+00
0.9836	1.1447e-02	4.0450e+01	0.0000e+00	0.0000e+00
1.0289	1.1447e-02	4.0450e+01	0.0000e+00	0.0000e+00
1.0763	1.1598e-02	4.0730e+01	3.1790e-03	5.9075e+00
1.1258	1.2304e-02	4.1985e+01	1.4254e-02	2.5322e+01
1.1776	1.3483e-02	4.3987e+01	2.2753e-02	3.8642e+01
1.2318	1.5043e-02	4.6520e+01	2.8778e-02	4.6724e+01
1.2885	1.7100e-02	4.9714e+01	3.6294e-02	5.6333e+01
1.3478	1.9670e-02	5.3527e+01	4.3329e-02	6.4293e+01
1.4099	2.2669e-02	5.7781e+01	4.8344e-02	6.8578e+01
1.4748	2.5497e-02	6.1615e+01	4.3567e-02	5.9083e+01
1.5427	2.8072e-02	6.4955e+01	3.7944e-02	4.9193e+01
1.6137	3.0752e-02	6.8276e+01	3.7739e-02	4.6775e+01
1.6879	3.3889e-02	7.1993e+01	4.2234e-02	5.0042e+01
1.7656	3.7308e-02	7.5866e+01	4.4010e-02	4.9852e+01
1.8469	4.0457e-02	7.9276e+01	3.8748e-02	4.1960e+01
1.9319	4.3190e-02	8.2105e+01	3.2149e-02	3.3282e+01
2.0208	4.6004e-02	8.4890e+01	3.1647e-02	3.1321e+01
2.1138	4.8094e-02	8.6867e+01	2.2467e-02	2.1257e+01
2.2111	5.0059e-02	8.8645e+01	2.0197e-02	1.8268e+01
2.3129	5.2663e-02	9.0897e+01	2.5590e-02	2.2128e+01
2.4194	5.5747e-02	9.3446e+01	2.8966e-02	2.3945e+01
2.5307	5.9074e-02	9.6076e+01	2.9878e-02	2.3612e+01
2.6472	6.2458e-02	9.8632e+01	2.9048e-02	2.1946e+01
2.7691	6.5707e-02	1.0098e+02	2.6664e-02	1.9259e+01
2.8965	6.8571e-02	1.0296e+02	2.2473e-02	1.5517e+01
3.0298	7.0993e-02	1.0456e+02	1.8170e-02	1.1994e+01
3.1693	7.3326e-02	1.0603e+02	1.6729e-02	1.0557e+01
3.3152	7.5683e-02	1.0745e+02	1.6153e-02	9.7448e+00
3.4678	7.8195e-02	1.0890e+02	1.6464e-02	9.4957e+00
3.6274	8.1181e-02	1.1054e+02	1.8709e-02	1.0315e+01
3.7943	8.4368e-02	1.1222e+02	1.9086e-02	1.0060e+01
3.9690	8.6275e-02	1.1318e+02	1.0919e-02	5.5023e+00
4.1517	8.7891e-02	1.1396e+02	8.8487e-03	4.2627e+00
4.3428	8.9660e-02	1.1478e+02	9.2567e-03	4.2630e+00
4.5426	9.1671e-02	1.1566e+02	1.0062e-02	4.4302e+00
4.7517	9.3760e-02	1.1654e+02	9.9916e-03	4.2055e+00
4.9704	9.5798e-02	1.1736e+02	9.3138e-03	3.7477e+00
5.1992	9.7842e-02	1.1815e+02	8.9371e-03	3.4378e+00
5.4385	9.9902e-02	1.1891e+02	8.6059e-03	3.1648e+00
5.6889	1.0192e-01	1.1962e+02	8.0727e-03	2.8381e+00
5.9507	1.0350e-01	1.2015e+02	6.0276e-03	2.0258e+00
6.2246	1.0485e-01	1.2058e+02	4.9226e-03	1.5816e+00
6.5111	1.0576e-01	1.2086e+02	3.1684e-03	9.7322e-01
6.8108	1.0726e-01	1.2130e+02	5.0075e-03	1.4705e+00
7.1243	1.0950e-01	1.2193e+02	7.1675e-03	2.0121e+00
7.4522	1.1215e-01	1.2264e+02	8.0561e-03	2.1621e+00
7.7952	1.1512e-01	1.2340e+02	8.6754e-03	2.2258e+00

Continued on next page



Particle Technology Labs

Analysis

Operator: JF
 Sample ID: 5141670A

Date:2021/05/26
 Filename:

Report

Operator: JF
 5141670A.qps

Date:2021/05/27

Pore Size Distribution continued

Pore width [nm]	Cumulative Pore Volume [cc/g]	Cumulative Surface Area [m ² /g]	dV(d) [cc/nm/g]	dS(d) [m ² /nm/g]
8.1540	1.1785e-01	1.2407e+02	7.6101e-03	1.8666e+00
8.5293	1.2046e-01	1.2469e+02	6.9616e-03	1.6324e+00
8.9219	1.2306e-01	1.2527e+02	6.6023e-03	1.4800e+00
9.3326	1.2588e-01	1.2587e+02	6.8646e-03	1.4711e+00
9.7621	1.2819e-01	1.2635e+02	5.3942e-03	1.1051e+00
10.2114	1.3048e-01	1.2679e+02	5.0916e-03	9.9724e-01
10.6814	1.3344e-01	1.2735e+02	6.2912e-03	1.1780e+00
11.1731	1.3617e-01	1.2784e+02	5.5560e-03	9.9454e-01
11.6874	1.3864e-01	1.2826e+02	4.8111e-03	8.2331e-01
12.2253	1.4133e-01	1.2870e+02	4.9941e-03	8.1700e-01
12.7880	1.4427e-01	1.2916e+02	5.2204e-03	8.1646e-01
13.3766	1.4721e-01	1.2960e+02	4.9968e-03	7.4709e-01
13.9923	1.5015e-01	1.3002e+02	4.7700e-03	6.8180e-01
14.6364	1.5256e-01	1.3035e+02	3.7487e-03	5.1225e-01
15.3100	1.5474e-01	1.3063e+02	3.2408e-03	4.2335e-01
16.0147	1.5688e-01	1.3090e+02	3.0358e-03	3.7913e-01
16.7518	1.5900e-01	1.3115e+02	2.8728e-03	3.4299e-01
17.5229	1.6109e-01	1.3139e+02	2.7073e-03	3.0901e-01
18.3294	1.6312e-01	1.3161e+02	2.5199e-03	2.7495e-01
19.1731	1.6522e-01	1.3183e+02	2.4908e-03	2.5983e-01
20.0556	1.6768e-01	1.3208e+02	2.7908e-03	2.7831e-01
20.9787	1.6976e-01	1.3228e+02	2.2475e-03	2.1426e-01
21.9443	1.7182e-01	1.3246e+02	2.1293e-03	1.9407e-01
22.9544	1.7387e-01	1.3264e+02	2.0389e-03	1.7764e-01
24.0109	1.7591e-01	1.3281e+02	1.9261e-03	1.6044e-01
25.1161	1.7743e-01	1.3293e+02	1.3784e-03	1.0976e-01
26.2721	1.7846e-01	1.3301e+02	8.9040e-04	6.7778e-02
27.4814	1.7997e-01	1.3312e+02	1.2451e-03	9.0613e-02
28.7463	1.8297e-01	1.3333e+02	2.3743e-03	1.6519e-01
30.0694	1.8646e-01	1.3356e+02	2.6391e-03	1.7553e-01
31.4534	1.8881e-01	1.3371e+02	1.6973e-03	1.0792e-01
32.9012	1.9114e-01	1.3385e+02	1.6067e-03	9.7661e-02
34.4155	1.9347e-01	1.3399e+02	1.5396e-03	8.9475e-02
35.9996	1.9804e-01	1.3424e+02	2.8828e-03	1.6016e-01



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Analysis

Operator: JF
Sample ID: 5141670A

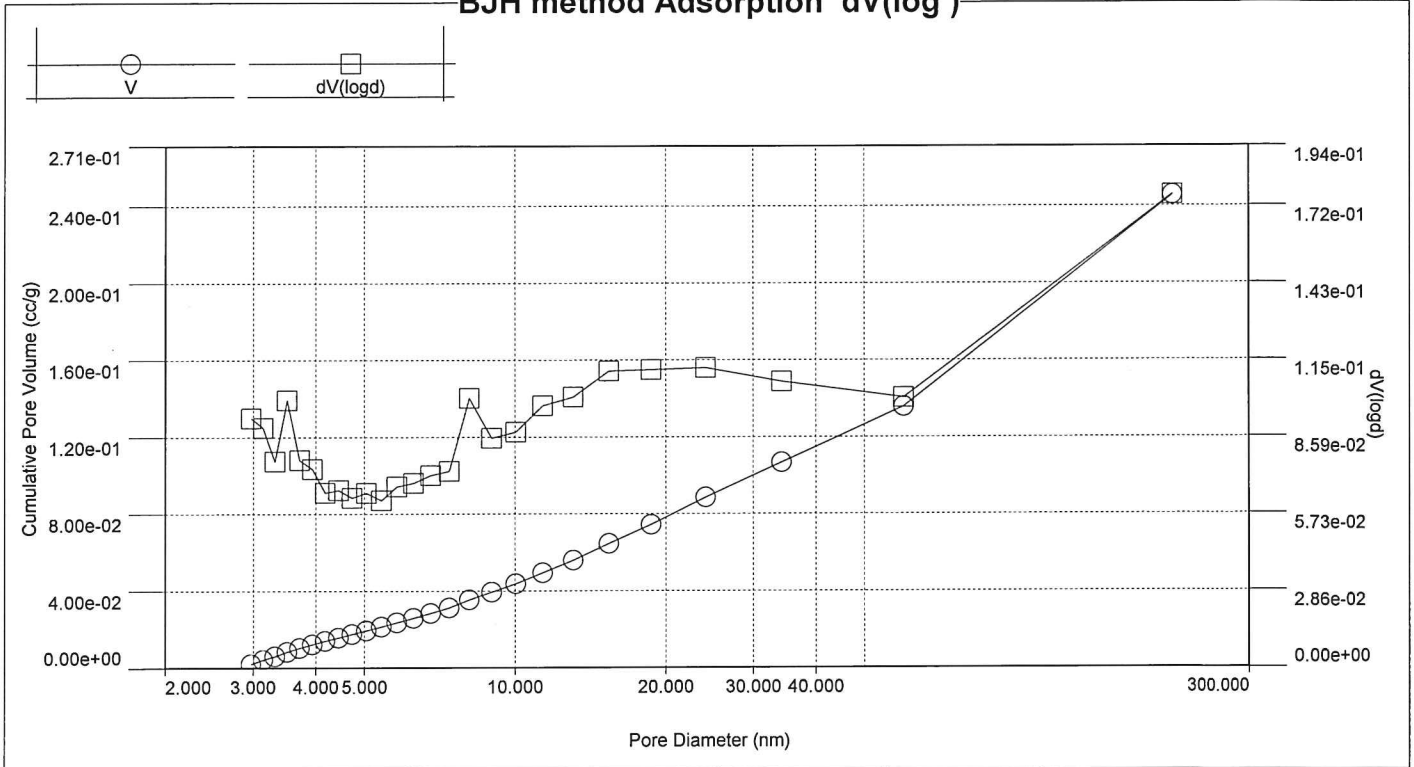
Date: 2021/05/26
Filename:

Report

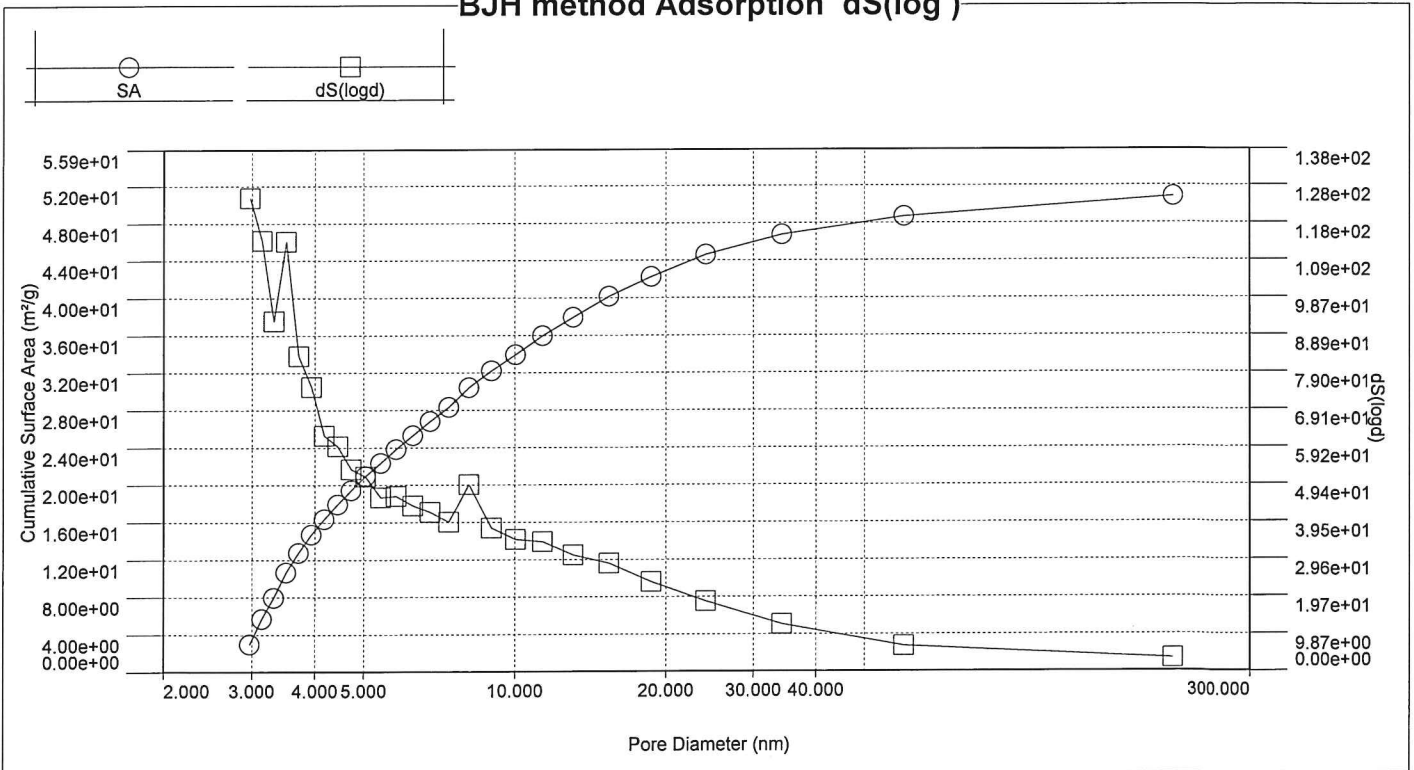
Operator: JF
5141670A.qps

Date: 2021/05/27

BJH method Adsorption dV(log)



BJH method Adsorption dS(log)





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Analysis

Operator: JF
 Sample ID: 5141670A

Date: 2021/05/26

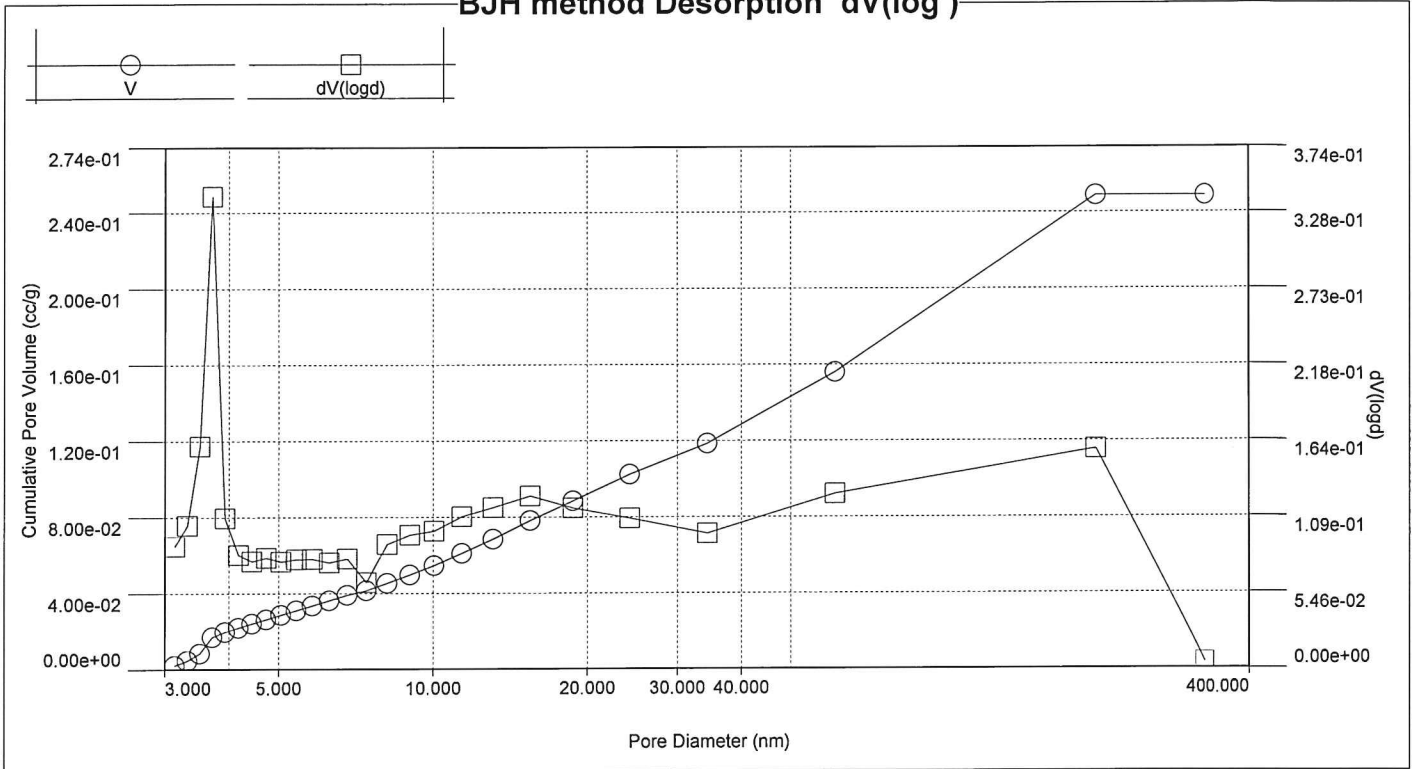
Filename:

Report

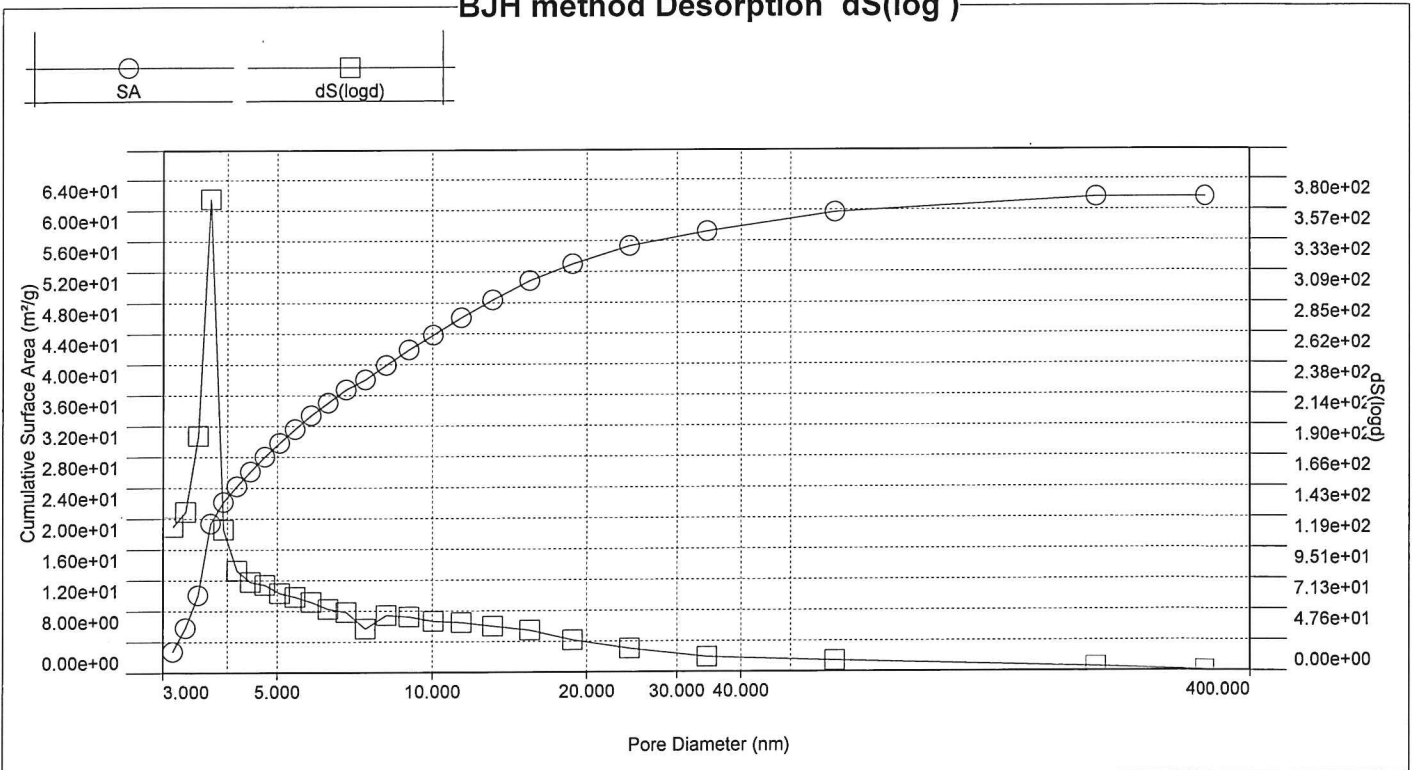
Operator: JF
 5141670A.qps

Date: 2021/05/27

BJH method Desorption dV(log)



BJH method Desorption dS(log)





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version 5.21



Analysis
Operator: JF
Sample ID: 5141670A

Date:2021/05/26
Filename:

Report
Operator: JF
5141670A.qps

Date:2021/05/27

Pore Size Distribution

Table with 5 columns: Pore width [nm], Cumulative Pore Volume [cc/g], Cumulative Surface Area [m²/g], dV(d) [cc/nm/g], and dS(d) [m²/nm/g]. It contains 50 rows of data points.

Continued on next page



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Analysis Operator: JF
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5141670A.qps

Date: 2021/05/27

Pore Size Distribution continued

Pore width [nm]	Cumulative Pore Volume [cc/g]	Cumulative Surface Area [m ² /g]	dV(d) [cc/nm/g]	dS(d) [m ² /nm/g]
8.1540	1.1785e-01	1.2407e+02	7.6101e-03	1.8666e+00
8.5293	1.2046e-01	1.2469e+02	6.9616e-03	1.6324e+00
8.9219	1.2306e-01	1.2527e+02	6.6023e-03	1.4800e+00
9.3326	1.2588e-01	1.2587e+02	6.8646e-03	1.4711e+00
9.7621	1.2819e-01	1.2635e+02	5.3942e-03	1.1051e+00
10.2114	1.3048e-01	1.2679e+02	5.0916e-03	9.9724e-01
10.6814	1.3344e-01	1.2735e+02	6.2912e-03	1.1780e+00
11.1731	1.3617e-01	1.2784e+02	5.5560e-03	9.9454e-01
11.6874	1.3864e-01	1.2826e+02	4.8111e-03	8.2331e-01
12.2253	1.4133e-01	1.2870e+02	4.9941e-03	8.1700e-01
12.7880	1.4427e-01	1.2916e+02	5.2204e-03	8.1646e-01
13.3766	1.4721e-01	1.2960e+02	4.9968e-03	7.4709e-01
13.9923	1.5015e-01	1.3002e+02	4.7700e-03	6.8180e-01
14.6364	1.5256e-01	1.3035e+02	3.7487e-03	5.1225e-01
15.3100	1.5474e-01	1.3063e+02	3.2408e-03	4.2335e-01
16.0147	1.5688e-01	1.3090e+02	3.0358e-03	3.7913e-01
16.7518	1.5900e-01	1.3115e+02	2.8728e-03	3.4299e-01
17.5229	1.6109e-01	1.3139e+02	2.7073e-03	3.0901e-01
18.3294	1.6312e-01	1.3161e+02	2.5199e-03	2.7495e-01
19.1731	1.6522e-01	1.3183e+02	2.4908e-03	2.5983e-01
20.0556	1.6768e-01	1.3208e+02	2.7908e-03	2.7831e-01
20.9787	1.6976e-01	1.3228e+02	2.2475e-03	2.1426e-01
21.9443	1.7182e-01	1.3246e+02	2.1293e-03	1.9407e-01
22.9544	1.7387e-01	1.3264e+02	2.0389e-03	1.7764e-01
24.0109	1.7591e-01	1.3281e+02	1.9261e-03	1.6044e-01
25.1161	1.7743e-01	1.3293e+02	1.3784e-03	1.0976e-01
26.2721	1.7846e-01	1.3301e+02	8.9040e-04	6.7778e-02
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32.9012	1.9114e-01	1.3385e+02	1.6067e-03	9.7661e-02
34.4155	1.9347e-01	1.3399e+02	1.5396e-03	8.9475e-02
35.9996	1.9804e-01	1.3424e+02	2.8828e-03	1.6016e-01



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Analysis

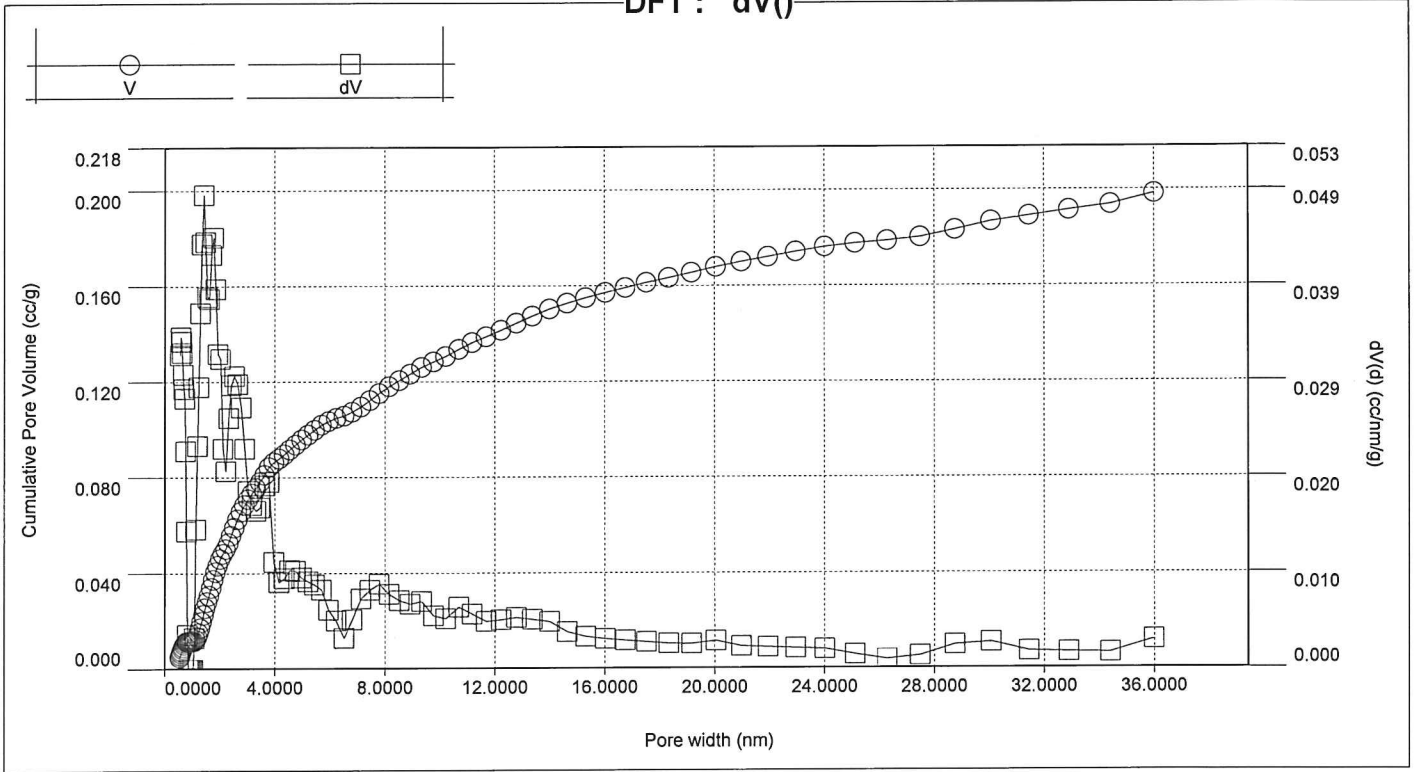
Operator: JF
 Sample ID: 5141670A

Date: 2021/05/26
 Filename:

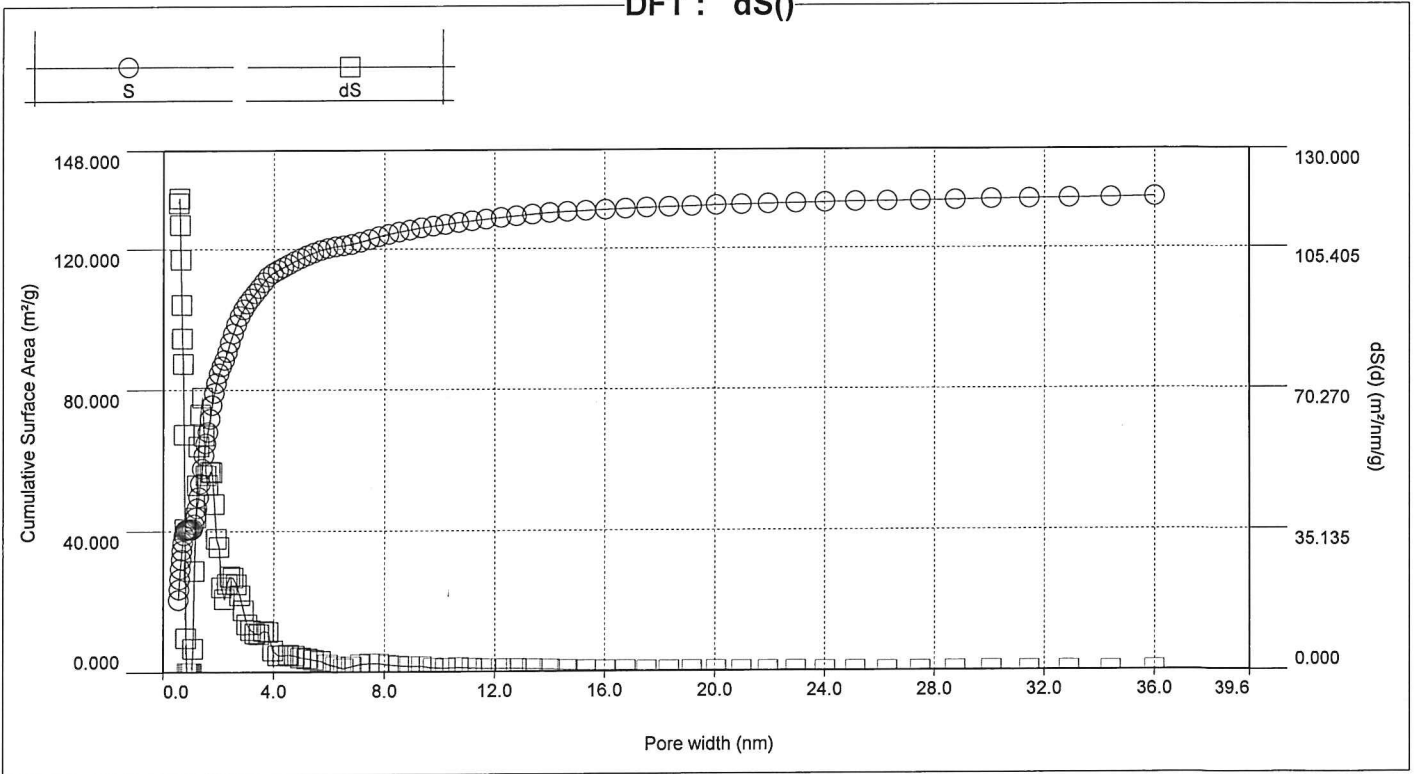
Report Operator: JF
 5141670A.qps

Date: 2021/05/27

DFT : dV()



DFT : dS()





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Analysis

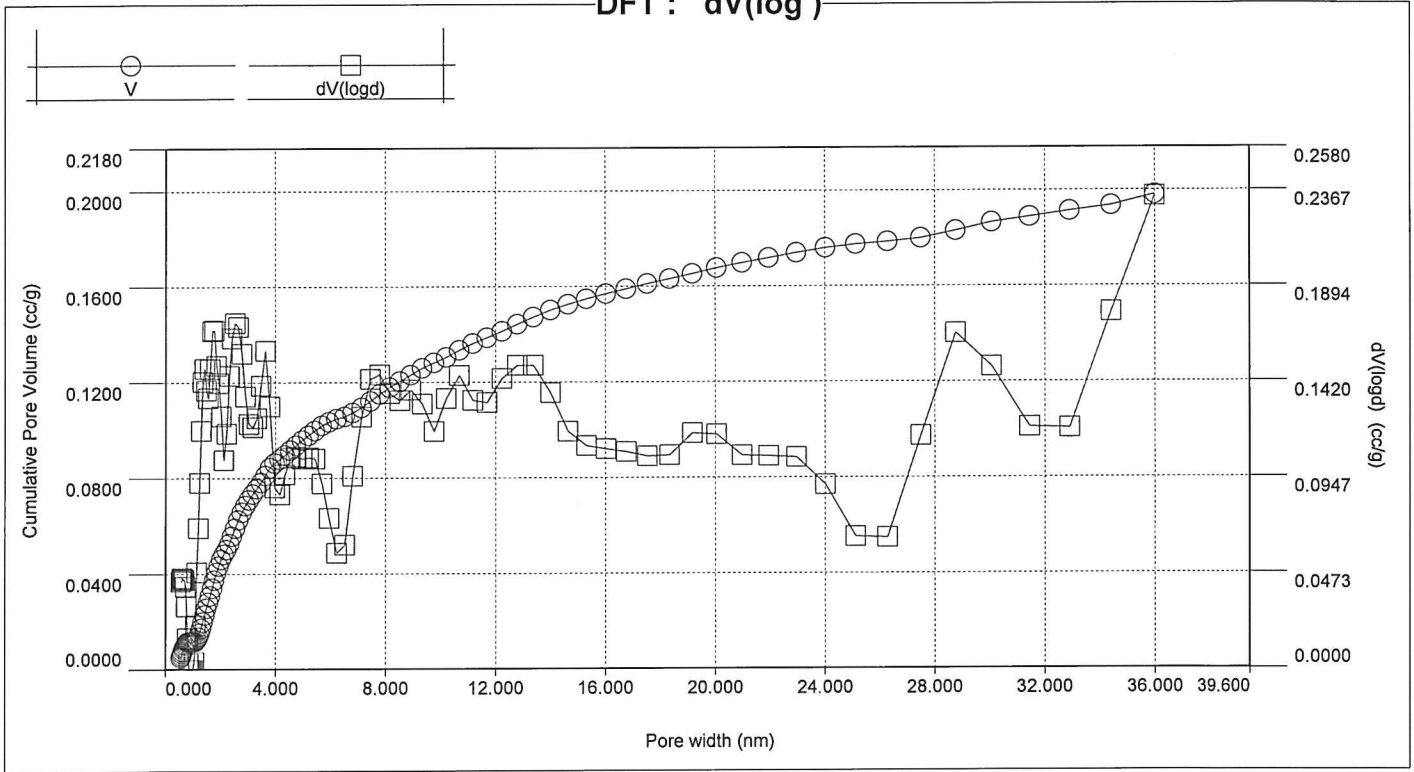
Operator: JF
Sample ID: 5141670A

Date: 2021/05/26
Filename:

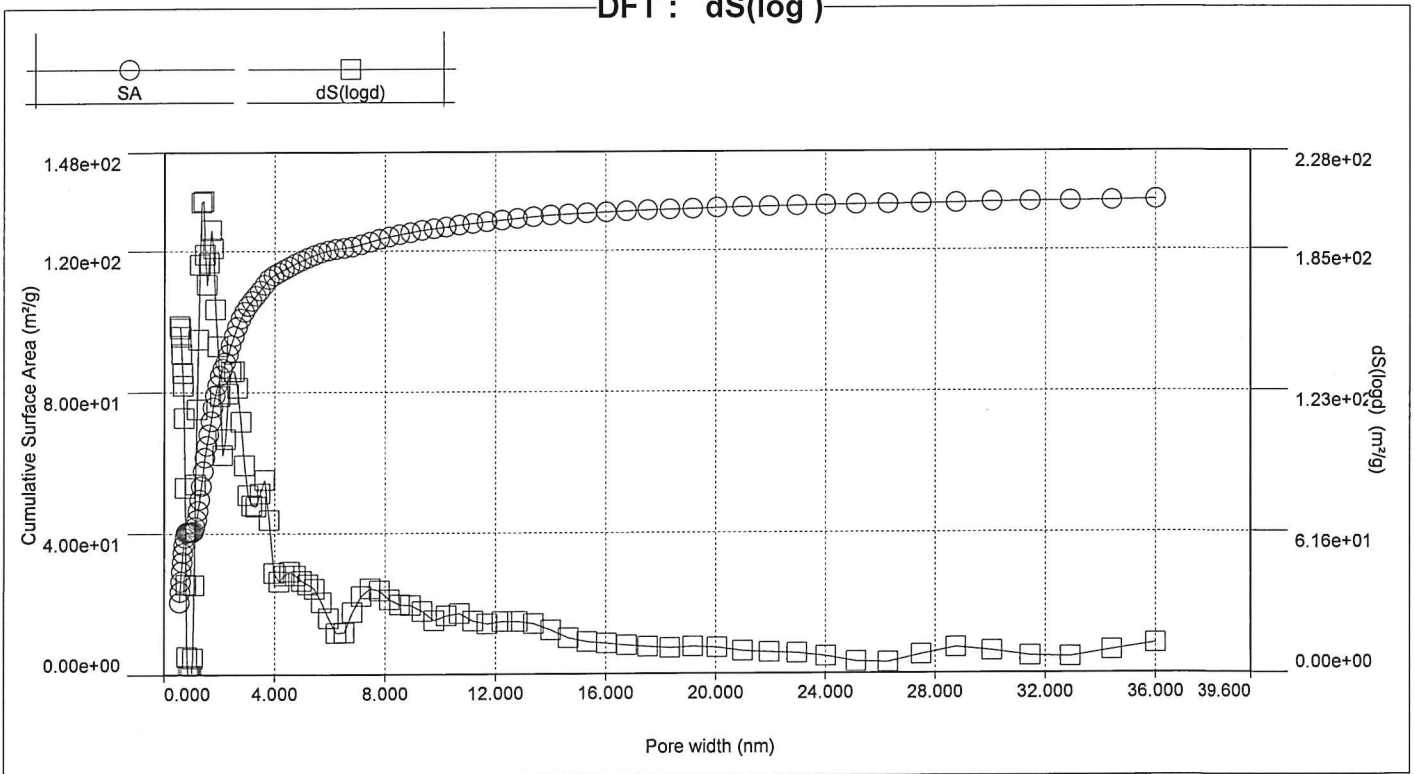
Report Operator: JF
5141670A.qps

Date: 2021/05/27

DFT : dV(logd)



DFT : dS(log)





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Analysis

Operator: JF
Sample ID: 5141670A

Date: 2021/05/26

Filename:

Report

Operator: JF
5141670A.qps

Date: 2021/05/27

DFT : Fitting Comparison

