Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM
Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM

Summary Report

Experiment 1: CoHe pulse chemisorption

Analysis type: Pulse Chemisorption
Calibration: None
Measured flow rate: 2,230.7 µmol/min
Signal offset: 0.00000
Signal inverted: Yes

Peak Number	Temperature at Maximum (°C)	Area	Peak Height
1	35.0	3.0893e-04	-4.9137e-04
2	34.9	8.3370e-04	-1.2817e-03
3	34.9	1.2278e-03	-1.7684e-03
4	35.0	1.5973e-03	-2.2102e-03
5	34.9	1.9146e-03	-2.5773e-03
6	35.0	2.2644e-03	-2.9275e-03
7	34.9	2.6418e-03	-3.2764e-03
8	35.0	2.4404e-03	-3.5437e-03
9	35.1	2.4753e-03	-3.7879e-03
10	34.9	2.8187e-03	-4.0064e-03

Injection Number	Injection Type	Injection Volume (mL)
1	Loop	0.49810
2	Loop	0.49810
3	Loop	0.49810
4	Loop	0.49810
5	Loop	0.49810
6	Loop	0.49810
7	Loop	0.49810
8	Loop	0.49810
9	Loop	0.49810
10	Loop	0.49810

Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM
Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM

Pulse Chemisorption Report

Experiment 1 CoHe pulse chemisorption
Analysis type: Pulse Chemisorption
Calibration: None
Measured flow rate: 2,230.7 µmol/min
Signal offset: 0.00000
Signal inverted: Yes
Number of Peaks Used for Saturation: 1

Peak Table

Peak Number	Temperature at Maximum (°C)	Quantity Adsorbed (µmol/g)	Cumulative Quantity (µmol/g)
1	35.0	13.18535	13.18535
2	34.9	10.42840	23.61375
3	34.9	8.35788	31.97163
4	35.0	6.41695	38.38857
5	34.9	4.74987	43.13845
6	35.0	2.91191	46.05036
7	34.9	0.92919	46.97955
8	35.0	1.98731	48.96686
9	35.1	1.80427	50.77113
10	34.9	0.00000	50.77113

Pulse Chemisorption Analysis Summary

Element	Percent of Sample Mass (%)	Percent Reduced (%)	MxOy X	MxOy Y	AMU	Stoichiometry Factor	Atomic Cross-Sectional Area (nm²)	Density (g/cm³)
molybdenum	20.380	100.00	1	0	95.940	1.000	0.0730	10.220

2640- The Active Metal Table does not specify a stoichiometry factor for the adsorptive Carbon Monoxide of the element molybdenum. One (1.0) was substituted for this value in the calculations.

Active loop volume at 110.0 °C: 1.5963 µmol
Cumulative quantity: 50.77113 µmol/g
Metal dispersion: 2.3901 %
Fractional coverage: 0.023901
Metallic surface area: 2.2320 m²/g sample
Metallic surface area: 10.9519 m²/g metal
Crystallite size (hemisphere): 536.0582 Å
Crystallite size (cube): 446.7152 Å

Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM
Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM

Active Surface Area Report

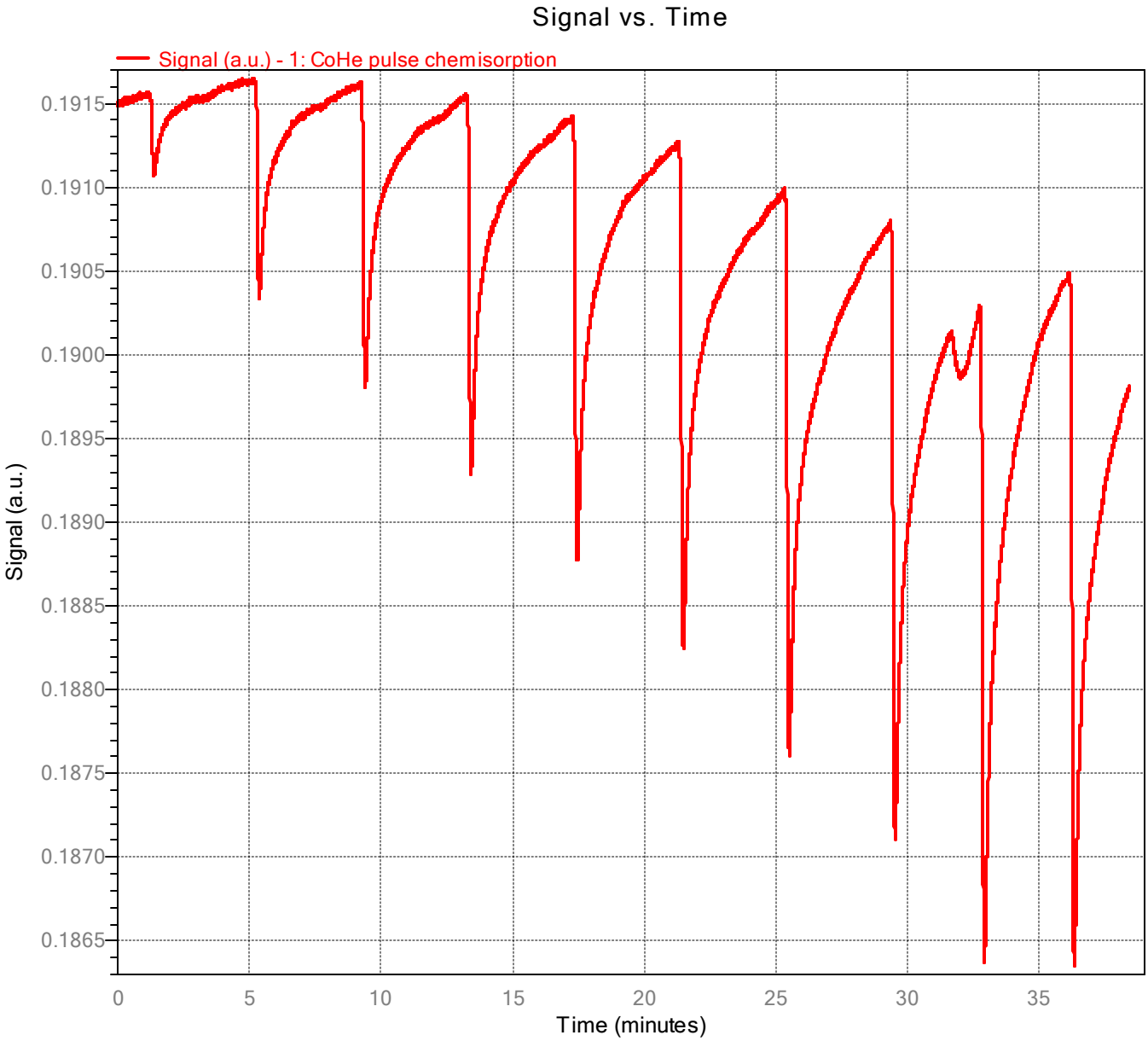
Active Surface Area

4615- No experiments were selected for inclusion in this report.

Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM

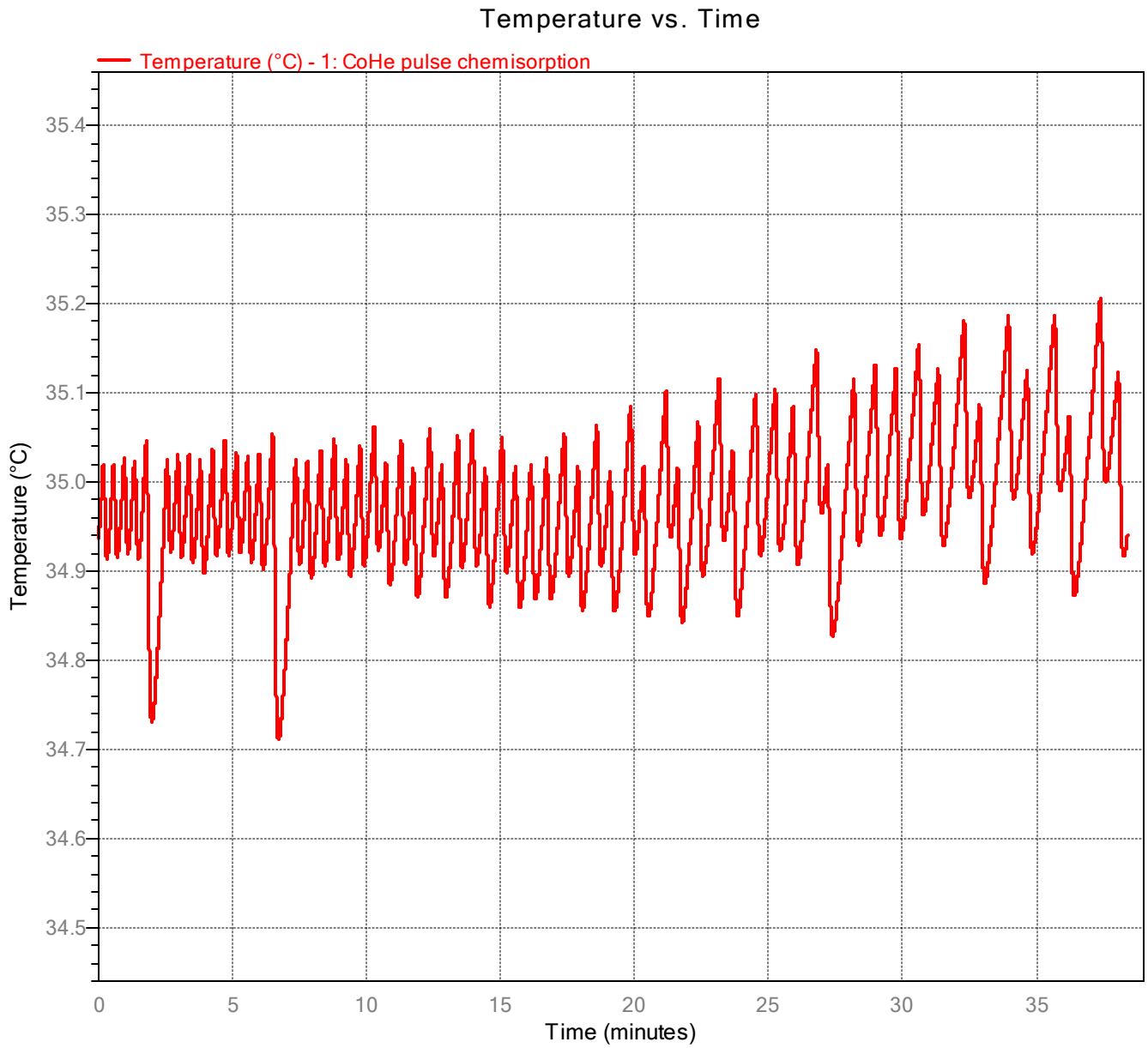
Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM



Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM

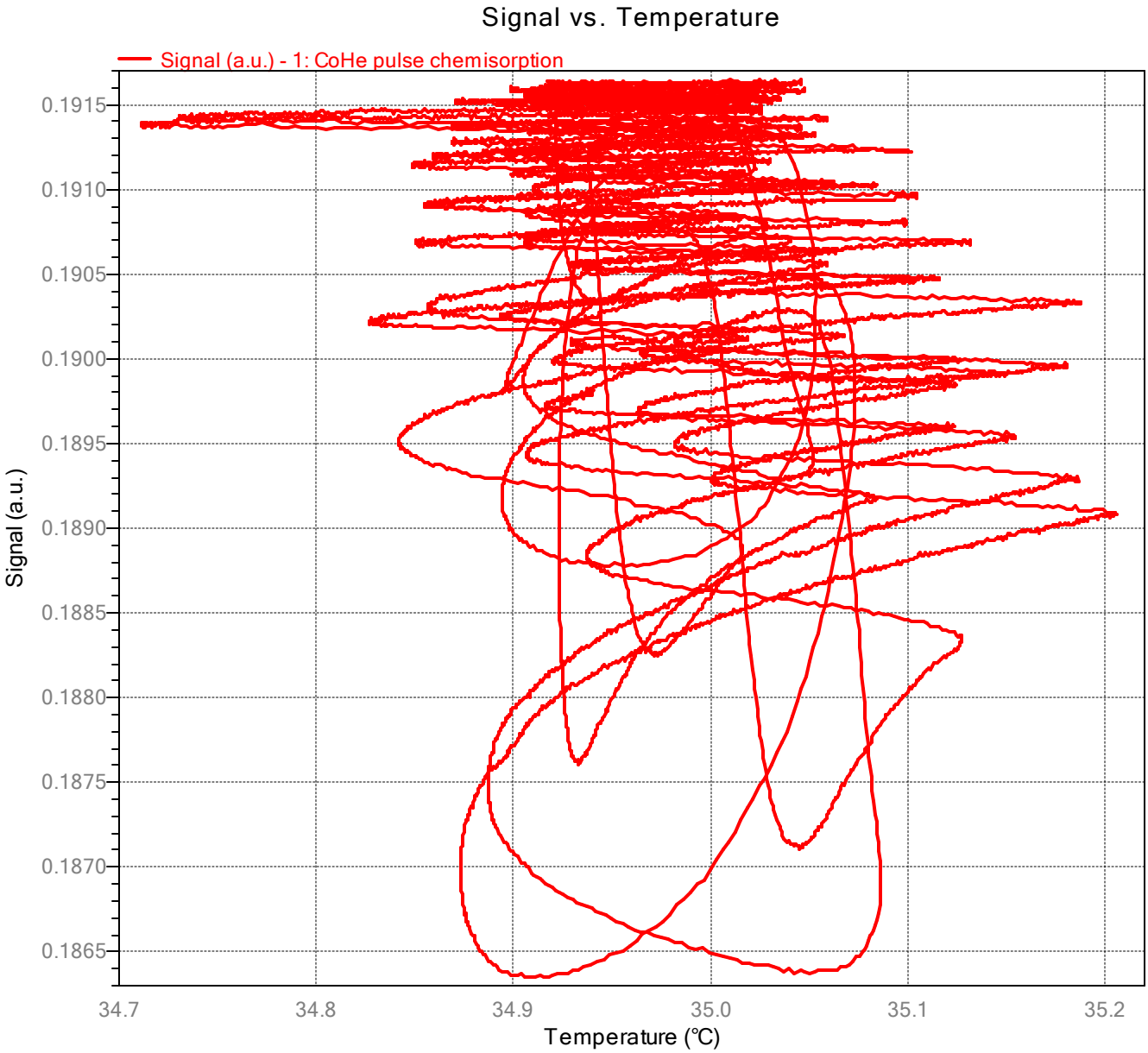
Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM



Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM

Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM



Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM
Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM

Sample Information

Method: Default
Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
Mass type: Entered
Sample mass: 0.1078 g
Density: 1.000 g/cm³
Type of data: Automatically collected
Instrument type: 2930
Original instrument type: 2930
Comments:

Active Metals Table

Element	Atomic Weight	Atomic Cross Sect. Area (nm²)	Density (g/cm³)	Percent of Sample Mass (%)	Percent Reduced (%)	MxOy X	MxOy Y
molybdenum	95.940	0.0730	10.220	20.380	100.00	1	0
	Adsorptive Carbon Monoxide-Helium	Stoichiometry 1.000					

Analysis Conditions

Analysis conditions: Analysis Conditions
View conditions for: AutoChem III 2930

Baseline Options

Stable Baseline
Slope threshold: 0.010 %/min
Duration: 5.00 min
Change from Baseline
Acceleration threshold: 0.200 %/min²
Duration: 0.10 min
Return to Baseline
Acceleration threshold: 0.050 %/min²
Duration: 1.00 min

Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM
Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM

Tasks

	Description	Details
1.01	Experiment	--- CoHe pulse chemisorption --- Pulse
1.02	Instrument Settings	--- Instrument Settings --- Carrier: H2Ar @ 50.00 (None @ 100.00) (Bypass) (Bypass) (Fill) (Analyze) Trap
1.03	Temperature Ramp	--- Temperature Ramp --- Type: Sample Temperature: 500.0 °C Ramp rate: 10.0 °C/min Hold time: 90.00 min
1.04	Instrument Settings	--- Instrument Settings --- Carrier: He @ 50.00 (H2Ar @ 50.00) (Bypass) (Bypass) (Fill) (Analyze) Bypass
1.05	Wait	--- Wait --- Wait 60.00 min.
1.06	Instrument Settings	--- Instrument Settings --- Filaments:245.0 °C (Disabled)
1.07	Temperature Ramp	--- Temperature Ramp --- Type: Sample Temperature: 35.0 °C Ramp rate: 90.0 °C/min Hold time: 5.00 min
1.08	Instrument Settings	--- Instrument Settings --- Loop: COHe @ 50.00 (None @ 100.00) Reflux: 20.0 °C (Disabled) Flask: 20.0 °C (Disabled)
1.09	Wait	--- Wait --- Wait until baseline and temperatures are stable.
1.10	Start Recording	--- Start Recording --- One measurement every 0.10 s Set external trigger: No
1.11	Start Repeat	--- Start Repeat --- Repeat until peaks are equal or 25 times.
1.12	Dose	--- Dose --- Inject loop gas Wait for change in baseline or 2.00 min, then wait for a return to baseline.
1.13	Stop Repeat	--- Stop Repeat ---
1.14	Stop Recording	--- Stop Recording ---

Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM
Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM

Tasks

	Description	Details
1.15	Instrument Settings	--- Instrument Settings --- Loop: None @ 50.00 (COHe @ 50.00) Filaments:Disabled (245.0 °C)
1.16	Wait	--- Wait --- Wait 5.00 min.
	Termination	--- Termination --- Carrier: None @ 100.00 (He @ 50.00) Loop: None @ 100.00 (None @ 50.00) Reflux: Disabled (20.0 °C) Flask: Disabled (20.0 °C) Sample: Ambient (35.0 °C) Rate: Ambient (90.0 °C/min)

Adsorptive Properties

Adsorptive:	Helium (He)
Maximum manifold pressure:	123.323 kPa
Therm. tran. hard-sphere diameter:	2.6300 Å
Molecular cross-sectional area:	0.123 nm²
Adsorbate molecular weight:	4.00
Mass flow constant:	1.000
Relative thermal conductivity:	5.84
Gas blend:	No
Adsorbed-phase free-space correction:	No
Fluid properties:	C:\dev\product\2930\example-data\helium.FPI
Dosing method:	Normal

Adsorptive:	Carbon Monoxide-Helium (COHe)
Maximum manifold pressure:	123.323 kPa
Therm. tran. hard-sphere diameter:	3.5900 Å
Molecular cross-sectional area:	0.125 nm²
Adsorbate molecular weight:	28.01
Mass flow constant:	1.000
Relative thermal conductivity:	5.29
Gas blend:	Yes
Inert gas:	Helium
Active gas:	Carbon Monoxide
% Active Concentration	10.320 %
Adsorbed-phase free-space correction:	Yes
Fluid properties:	H:\FPI\fpiv7\carbon monoxide.fpi
Dosing method:	Normal

Adsorptive:	Hydrogen-Argon (H2Ar)
Maximum manifold pressure:	123.323 kPa
Therm. tran. hard-sphere diameter:	2.9680 Å
Molecular cross-sectional area:	0.123 nm²

Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM
Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM

Adsorbate molecular weight:	2.02
Mass flow constant:	1.000
Relative thermal conductivity:	1.40
Gas blend:	Yes
Inert gas:	Argon
Active gas:	Hydrogen
% Active Concentration	10.000 %
Adsorbed-phase free-space correction:	Yes
Fluid properties:	H:\FPI\fpiv7\hydrogen.fpi
Dosing method:	Normal

Report Options

Peak Detection/Integration Options

Baseline mode:	Best fit baseline
Minimum peak height:	0.25 % F.S.
Peak smoothing:	0 points
Sensitivity:	1.0e-02 % F.S.
Maximum shoulder ratio:	33%
Maximum group separation:	33%
Minimum peak area:	1.0 % F.S.·min
Maximum baseline slope:	0.1 % F.S./sec

Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM
Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM

Sample Log

Date	Time	Log Message
5/31/2025	12:22:59 PM	Starting a sample analysis for C:\Users\b220a\One...\000-160 Mo-C_B-CO pulse-run2.SMP on port 1.
5/31/2025	12:22:59 PM	1.01 Experiment started. Type: Pulse
5/31/2025	12:22:59 PM	1.02 Set carrier gas: H2Ar Loop gas: N2He Trap valve: Trap Analysis valve: Analysis Sample temperature: 20.0 °C Detector enabled: No
5/31/2025	12:23:04 PM	1.03 Ramping Sample temperature at 10.0 °C/min to 500.0 °C for 90 minutes.
5/31/2025	2:40:40 PM	1.04 Set carrier gas: He Loop gas: N2He Trap valve: Bypass Analysis valve: Analysis Sample temperature: 500.0 °C Detector enabled: No
5/31/2025	2:40:45 PM	1.05 Wait for time. Time: 3600 s
5/31/2025	3:40:45 PM	1.06 Set carrier gas: He Loop gas: N2He Trap valve: Bypass Analysis valve: Analysis Sample temperature: 500.0 °C Detector enabled: Yes
5/31/2025	3:40:46 PM	1.07 Ramping Sample temperature at 90.0 °C/min to 35.0 °C for 5 minutes.
5/31/2025	3:58:13 PM	1.08 Set carrier gas: He Loop gas: COHe Trap valve: Bypass Analysis valve: Analysis Sample temperature: 35.0 °C Detector enabled: Yes
5/31/2025	3:58:14 PM	1.09 Wait for baseline stable. Time: 300 s
5/31/2025	4:40:50 PM	A sample analysis for C:\Users\b220a\OneDrive\Documents\Micromeretics AutoChem III\Mihir\000-160 Mo-C_B-CO pulse-run2.SMP on port 1 was skipped.
5/31/2025	4:40:50 PM	Operation skipped by operator.
5/31/2025	4:40:50 PM	1.10 Recording started. Carrier gas: He Flow rate: 50.00 cm³ STP/min Loop gas: COHe Recording period: 0.10 s External trigger: No
5/31/2025	4:40:50 PM	1.11 Start repeat sequence. Repeat until peaks are equal 25 times.
5/31/2025	4:40:50 PM	1.12 Dose: Inject loop gas. Wait for change from baseline or time, then return to baseline. Time: 2 min
5/31/2025	4:41:50 PM	Inject loop gas Injection volume: 0.4981 mL. Atmospheric pressure: 742.00 mmHg. Ambient temperature: 25.8 °C
5/31/2025	4:44:51 PM	1.13 Check for end of repeat sequence after 1 times. Continue repeating: Yes
5/31/2025	4:44:51 PM	1.12 Dose: Inject loop gas. Wait for change from baseline or time, then return to baseline. Time: 2 min
5/31/2025	4:45:52 PM	Inject loop gas Injection volume: 0.4981 mL. Atmospheric pressure: 741.97 mmHg. Ambient temperature: 25.9 °C
5/31/2025	4:48:53 PM	1.13 Check for end of repeat sequence after 2 times. Continue repeating: Yes
5/31/2025	4:48:53 PM	1.12 Dose: Inject loop gas. Wait for change from baseline or time, then return to baseline. Time: 2 min
5/31/2025	4:49:54 PM	Inject loop gas Injection volume: 0.4981 mL. Atmospheric pressure: 741.95 mmHg. Ambient temperature: 25.8 °C
5/31/2025	4:52:55 PM	1.13 Check for end of repeat sequence after 3 times. Continue repeating: Yes
5/31/2025	4:52:55 PM	1.12 Dose: Inject loop gas. Wait for change from baseline or time, then return to baseline. Time: 2 min
5/31/2025	4:53:55 PM	Inject loop gas Injection volume: 0.4981 mL. Atmospheric pressure: 741.97 mmHg. Ambient temperature: 25.6 °C
5/31/2025	4:56:56 PM	1.13 Check for end of repeat sequence after 4 times. Continue repeating: Yes
5/31/2025	4:56:56 PM	1.12 Dose: Inject loop gas. Wait for change from baseline or time, then return to baseline. Time: 2 min
5/31/2025	4:57:57 PM	Inject loop gas Injection volume: 0.4981 mL. Atmospheric pressure: 742.02 mmHg. Ambient temperature: 25.6 °C
5/31/2025	5:00:58 PM	1.13 Check for end of repeat sequence after 5 times. Continue repeating: Yes
5/31/2025	5:00:58 PM	1.12 Dose: Inject loop gas. Wait for change from baseline or time, then return to baseline. Time: 2 min

Sample: 000-160 Mo-C_B-CO pulse-run2
Operator: Mihir
Submitter:
File: C:\Users\kulka133\OneDrive - Michigan State University\CMS proje...\000-160 Mo-C_B-CO pulse-run2.SMP

Started: 5/31/2025 12:22:59 PM
Completed: 5/31/2025 5:24:17 PM
Sample mass: 0.1078 g
Report time: 1/19/2026 6:02:35 PM

Sample Log

Date	Time	Log Message
5/31/2025	5:01:59 PM	Inject loop gas Injection volume: 0.4981 mL. Atmospheric pressure: 742.00 mmHg. Ambient temperature: 25.5 °C
5/31/2025	5:05:00 PM	1.13 Check for end of repeat sequence after 6 times. Continue repeating: Yes
5/31/2025	5:05:00 PM	1.12 Dose: Inject loop gas. Wait for change from baseline or time, then return to baseline. Time: 2 min
5/31/2025	5:06:00 PM	Inject loop gas Injection volume: 0.4981 mL. Atmospheric pressure: 742.02 mmHg. Ambient temperature: 25.6 °C
5/31/2025	5:09:01 PM	1.13 Check for end of repeat sequence after 7 times. Continue repeating: Yes
5/31/2025	5:09:01 PM	1.12 Dose: Inject loop gas. Wait for change from baseline or time, then return to baseline. Time: 2 min
5/31/2025	5:10:02 PM	Inject loop gas Injection volume: 0.4981 mL. Atmospheric pressure: 741.98 mmHg. Ambient temperature: 25.6 °C
5/31/2025	5:12:24 PM	1.13 Check for end of repeat sequence after 8 times. Continue repeating: Yes
5/31/2025	5:12:24 PM	1.12 Dose: Inject loop gas. Wait for change from baseline or time, then return to baseline. Time: 2 min
5/31/2025	5:13:25 PM	Inject loop gas Injection volume: 0.4981 mL. Atmospheric pressure: 742.00 mmHg. Ambient temperature: 25.7 °C
5/31/2025	5:15:49 PM	1.13 Check for end of repeat sequence after 9 times. Continue repeating: Yes
5/31/2025	5:15:49 PM	1.12 Dose: Inject loop gas. Wait for change from baseline or time, then return to baseline. Time: 2 min
5/31/2025	5:16:50 PM	Inject loop gas Injection volume: 0.4981 mL. Atmospheric pressure: 742.02 mmHg. Ambient temperature: 25.7 °C
5/31/2025	5:19:13 PM	1.13 Check for end of repeat sequence after 10 times. Continue repeating: No
5/31/2025	5:19:13 PM	1.14 Recording ended.
5/31/2025	5:19:13 PM	1.15 Set carrier gas: He Loop gas: N2He Trap valve: Bypass Analysis valve: Analysis Sample temperature: 35.0 °C Detector enabled: No
5/31/2025	5:19:16 PM	1.16 Wait for time. Time: 300 s
5/31/2025	5:24:16 PM	2.01 Analysis terminated. Carrier gas: N2He Detector enabled: No Return to ambient temperature: Yes
5/31/2025	5:24:17 PM	Finished a sample analysis for C:\Users\b220a\One...\000-160 Mo-C_B-CO pulse-run2.SMP on port 1.