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DRYWALL ANALYSIS REPORT

Results from
Carbon Disulfide & Carbonyl Sulfide Verification

Regarding:
Gypsum Wallboard - 1/2" Regular
Cumberland City, TN

MAS Project: M49785

For:
Mr. Patrick Miller
Temple-Inland EHS
303 S. Temple Drive
Diboll, Texas 75941

October 12, 2009

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SUMMARY:

Regular drywall samples from Temple-Inland's Cumberland City, TN manufacturing plant were submitted for testing of carbon disulfide and carbonyl sulfide, (two problematic compounds associated with sulfur gas emissions) by a modified headspace analysis using gas chromatography and mass spectroscopy (GC/MS). A total of four samples were analyzed from the drywall submitted.

For comparison purposes, a series of MAS drywall controls (non-problematic drywall) were previously analyzed and found to contain an average of 2.6 ppb carbon disulfide. For each of the submitted samples, M49785-001 thru -004 the emission levels of carbon disulfide and carbonyl sulfide were below the quantitation limit (BQL). Based on these results, all of the submitted samples M49785-001 thru -004 were determined to be negative for sulfur off-gassing and are not considered problematic corrosive drywall types.

DESCRIPTION OF SAMPLES:

<u>MAS No.</u>	<u>Client Description</u>
M49785-001	½" Regular Gypsum Wallboard 1
M49785-002	½" Regular Gypsum Wallboard 2
M49785-003	½" Regular Gypsum Wallboard 3
M49785-004	½" Regular Gypsum Wallboard 4

PREPARATION AND ANALYSIS:

PREPARATION: A small subsample was removed from each of the submitted bulk drywall sample materials and weighed on an analytical balance. Each sample was powdered with a mortar and pestle then placed in a typical headspace container for analysis by GC/MS.

ANALYSIS: Tert-butyl methyl ether (MTBE) was used as an internal standard, and known concentrations of carbon disulfide and carbonyl sulfide were used as the external standards. The sample was then analyzed by GC/MS then compared to both the internal and external standards for quantification of carbon disulfide and carbonyl sulfide. Along with the submitted drywall samples, controls (corrosive problematic and non-problematic

type drywall) were run along with the primary samples as described. The amount of carbon disulfide found in the submitted drywall bulk samples were then compared to the MAS in-house controls.

RESULTS AND DISCUSSION:

Table 1 shows the results from the analysis of the submitted drywall sample.

TABLE 1
Four Samples of a Bulk Drywall Material from the Temple-Inland (Cumberland City, TN)

MAS No.	Client Description/Location	Weight (grams)	Carbon Disulfide (CS₂) Concentration (ppb)	Carbonyl Sulfide (COS) Concentration (ppb)
M49785-001	½” Regular Gypsum Wallboard 1	3.19	BQL (1.0)	BQL (4.0)
M49785-002	½” Regular Gypsum Wallboard 2	3.16	BQL (1.0)	BQL (4.0)
M49785-003	½” Regular Gypsum Wallboard 3	3.04	BQL (1.1)	BQL (4.2)
M49785-004	½” Regular Gypsum Wallboard 4	3.05	BQL (1.1)	BQL (4.1)

The attached GC/MS spectra shows that the Temple-Inland samples M49785-001 thru -004 of the submitted drywall material emitted carbon disulfide below the quantitation limit (1.1 ppb). The average concentration of carbon disulfide (background amounts) in the MAS in-house controls is 2.6 ppb. Using the criteria of 4 X the standard deviation* of the in-house MAS controls ($2.6 + (4 \times 1.5) = 8.6$ ppb), it is our opinion, that the findings of BQL or ≤ 1.1 ppb of carbon disulfide along with BQL or ≤ 4.2 carbonyl sulfide confirms that these samples are not considered problematic corrosive drywall.

*Statistically 3 times the standard deviation (SD) encompasses 99.7 percent of the variation around the average for emission of carbon disulfide (CS₂) from the control drywall samples tested. Any CS₂ emission values at or beyond 3 times the SD would be considered significantly different from the controls and the sample would be considered an offensive drywall type. It is our opinion that a value of 4 times the SD is even more conservative statistically and would further strengthen the finding that the sample tested is an offensive drywall product.



Mark W. Rigler, Ph.D.
Senior Consulting Scientist



William E. Longo, Ph.D.
President

GC/MS RESULTS



Materials Analytical Services, LLC - Test Report

Bob Bertolami
 Temple-Inland
 150 Temple Drive
 Cumberland City, TN 37050

September 30, 2009

MAS Project #: M49785

Date Sampled: 09/14/09

Date Received: 09/16/09

Date Analyzed: 09/23/09

Client Proj. Name: 1/2" Reg Gypsum Wallboard

Analysis: Carbon Disulfide (CS₂) and Carbonyl Sulfide (COS) by GC/MS

Method: Headspace by GC/MS

Media: Drywall

MAS Sample ID	Client Sample ID	Analyte	ng/g	ppb	LOQ	Analyte	ng/g	ppb	LOQ
M49785 - 001	Gypsum Wallboard 1	Carbon Disulfide	BQL	BQL	1.0	Carbonyl Sulfide	BQL	BQL	4.0
M49785 - 002	Gypsum Wallboard 2	Carbon Disulfide	BQL	BQL	1.0	Carbonyl Sulfide	BQL	BQL	4.0
M49785 - 003	Gypsum Wallboard 3	Carbon Disulfide	BQL	BQL	1.1	Carbonyl Sulfide	BQL	BQL	4.2
M49785 - 004	Gypsum Wallboard 4	Carbon Disulfide	BQL	BQL	1.1	Carbonyl Sulfide	BQL	BQL	4.1

Control ID	Analyte	ng/g	ppb	LOQ	Analyte	ng/g	ppb	LOQ
Negative Control	Carbon Disulfide	BQL	BQL	1.0	Carbonyl Sulfide	BQL	BQL	3.9
Positive Control	Carbon Disulfide	272	87	1.0	Carbonyl Sulfide	44	18	4.1

BQL-Below Quantitation Limit
 LOQ-Limit Of Quantitation

Analyst: JJ

Review: *Randy Brown*
 Randy Brown
 Chemistry Department Manager

GC/MS SPECTRA

CS₂ & COS Sample Analysis Spreadsheet

Job No. M49785
 Client Temple-Inland
 Analyst JJ
 Date 9/30/2009
 Instrument GC/MS

Client Job ID: CS₂ & COS in Wallboard
 Project Name: 1/2" Reg Gypsum Wallboard
 Date Sampled: 09/14/09
 Date Received: 09/16/09
 Date Analyzed: 09/23/09

MW(COS) = 60.075
 k factor = 0.407

MW(CS₂) = 76.139
 k factor = 0.321

Lowest STD (ug/m): 10

31

Carbon Disulfide

MAS Sample ID	Client Sample ID	Sample Aliquot (g)	Result ng	ng/g	ppb	Detection Limit ppb
M49785 - 001	Gypsum Wallboard 1	3.19	BQL	BQL	BQL	1.0
M49785 - 002	Gypsum Wallboard 2	3.16	BQL	BQL	BQL	1.0
M49785 - 003	Gypsum Wallboard 3	3.04	BQL	BQL	BQL	1.1
M49785 - 004	Gypsum Wallboard 4	3.05	BQL	BQL	BQL	1.1

Control ID	Sample Aliquot (g)	Result ng	ng/g	ppb	Detection Limit ppb
Negative Control	3.20	BQL	BQL	BQL	1.0
Positive Control	3.10	842.91	272	87	1.0

Carbonyl Sulfide

MAS Sample ID	Client Sample ID	Sample Aliquot (g)	Result ng	ng/g	ppb	Quantitation Limit ppb
M49785 - 001	Gypsum Wallboard 1	3.19	BQL	BQL	BQL	4.0
M49785 - 002	2	3.16	BQL	BQL	BQL	4.0
M49785 - 003	3	3.04	BQL	BQL	BQL	4.2
M49785 - 004	4	3.05	BQL	BQL	BQL	4.1

Control ID	Sample Aliquot (g)	Result ng	ng/g	ppb	Quantitation Limit ppb
Negative Control	3.20	BQL	BQL	BQL	3.9
Positive Control	3.10	136.39	43.7	18	4.1

Quantitation Report

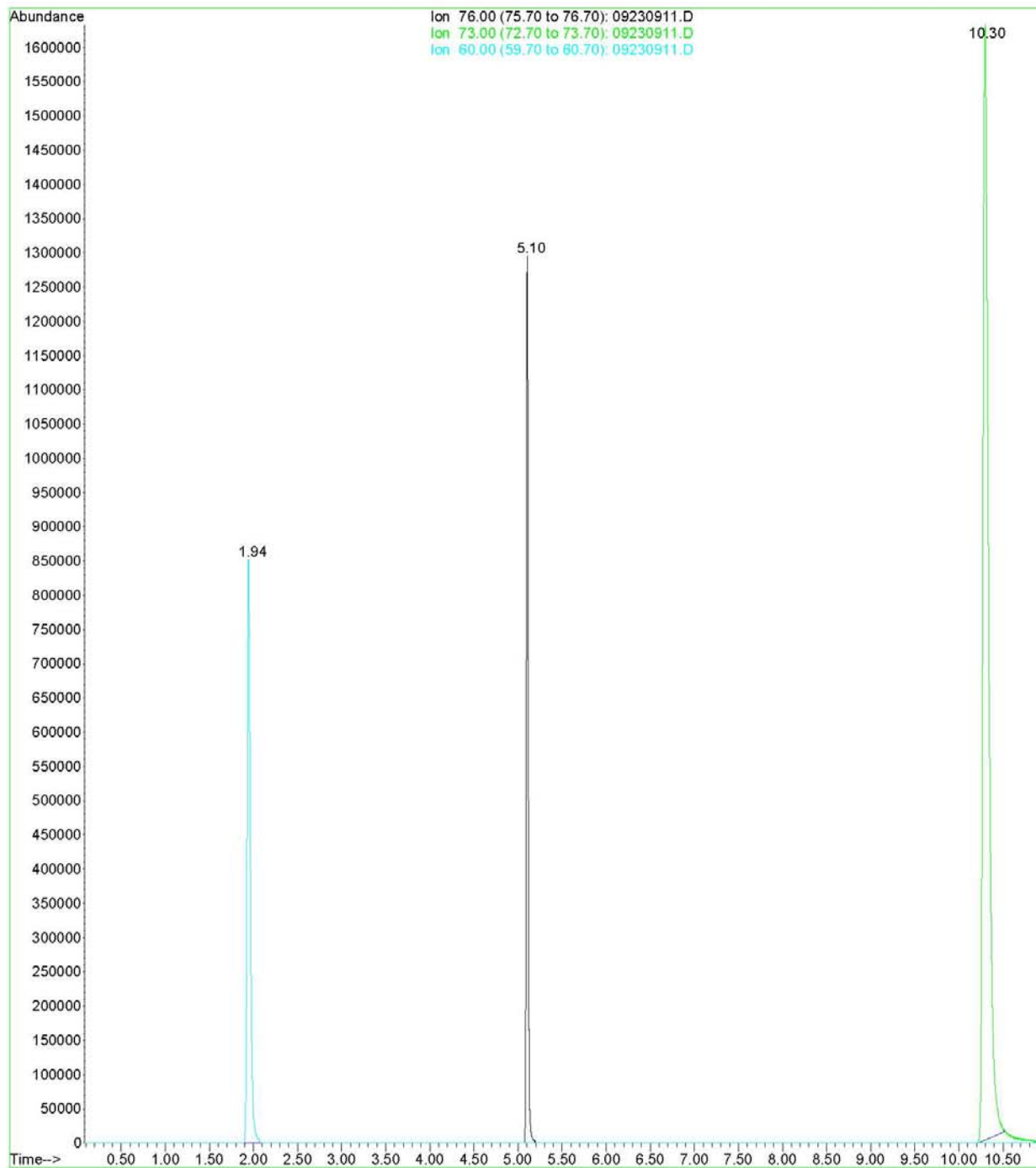
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 Misc : Multiplr: 1.00
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 Quant Time: Sep 23 16:56:22 2009 Quant Results File: 092209CS2_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2_DRYWALL.M (Chemstation Integrator)
 Title :
 Last Update : Tue Sep 22 17:26:55 2009
 Response via : Initial Calibration
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
-----	-----	-----	-----	-----	-----	-----
1) MTBE	10.30	73	71604356	740.00	ng	0.00
Target Compounds						Qvalue
2) Carbonyl sulfide	1.94	60	21343219	332.29	ng	99
3) Carbon Disulfide	5.10	76	18299935	162.75	ng	100
-----	-----	-----	-----	-----	-----	-----

(#) = qualifier out of range (m) = manual integration (+) = signals summed
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File : C:\MSDCHEM\1\DATA\092309\09230911.D
Operator : JJ
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Instrument : Instrumen
Sample Name: CCV-L4
Misc Info :
Vial Number: 11



Quantitation Report

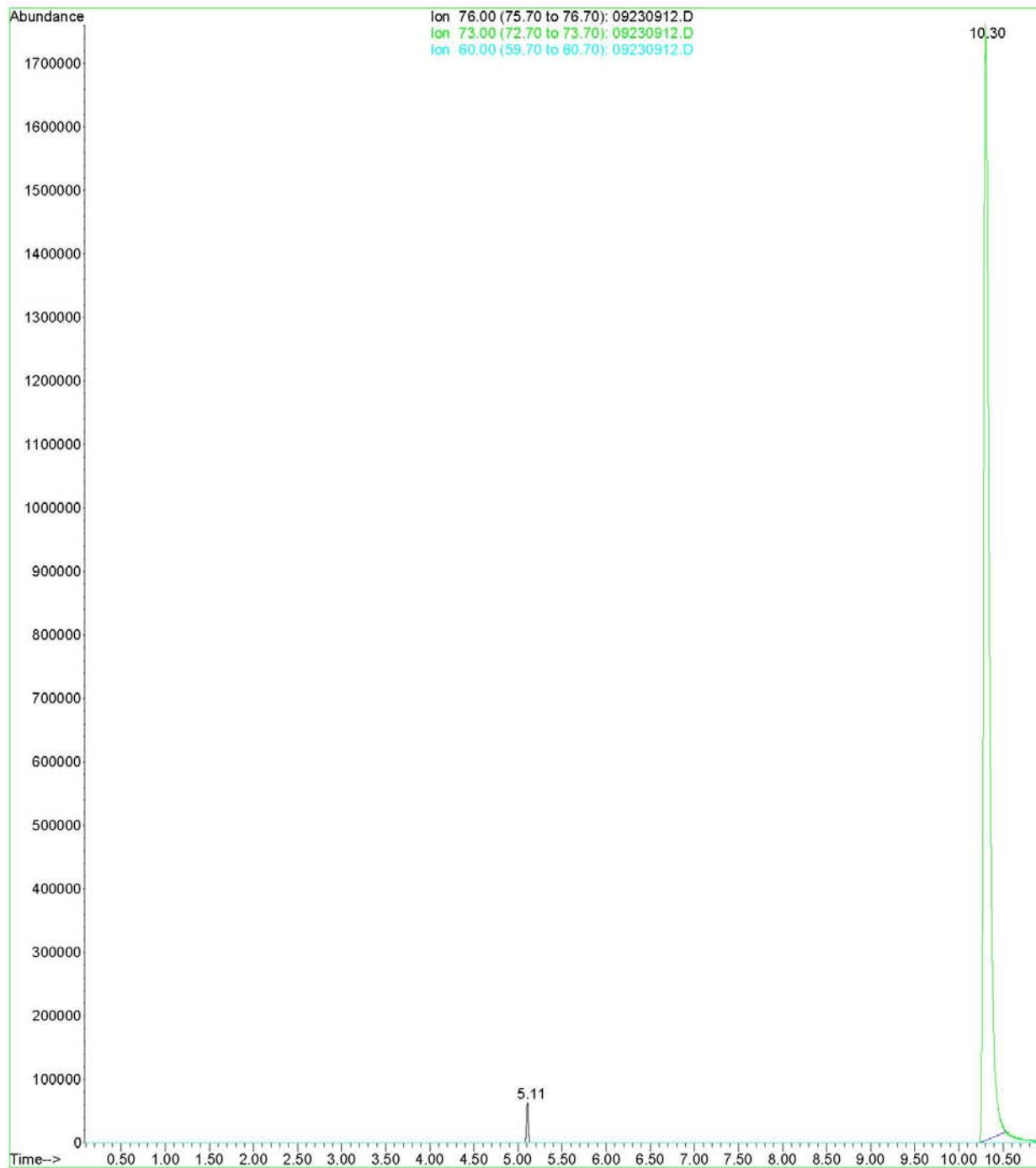
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 Sample : Blank Inst : Instrumen
 Misc : Multiplr: 1.00
 MS Integration Params: EVENTS.E
 Quant Time: Sep 24 10:38:56 2009 Quant Results File: 092209CS2_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2_DRYWALL.M (Chemstation Integrator)
 Title :
 Last Update : Tue Sep 22 17:26:55 2009
 Response via : Initial Calibration
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
-----	-----	-----	-----	-----	-----	-----
1) MTBE	10.30	73	76493335	740.00	ng	0.00
Target Compounds						Qvalue
2) Carbonyl sulfide	0.00	60	0		N.D.	
3) Carbon Disulfide	5.11	76	876388		Below Cal	95
-----	-----	-----	-----	-----	-----	-----

(#) = qualifier out of range (m) = manual integration (+) = signals summed
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File : C:\MSDCHEM\1\DATA\092309\09230912.D
Operator : JJ
Acquired : 23 Sep 2009 5:20 pm using AcqMethod 8260WALL
Instrument : Instrumen
Sample Name: Blank
Misc Info :
Vial Number: 12



Quantitation Report

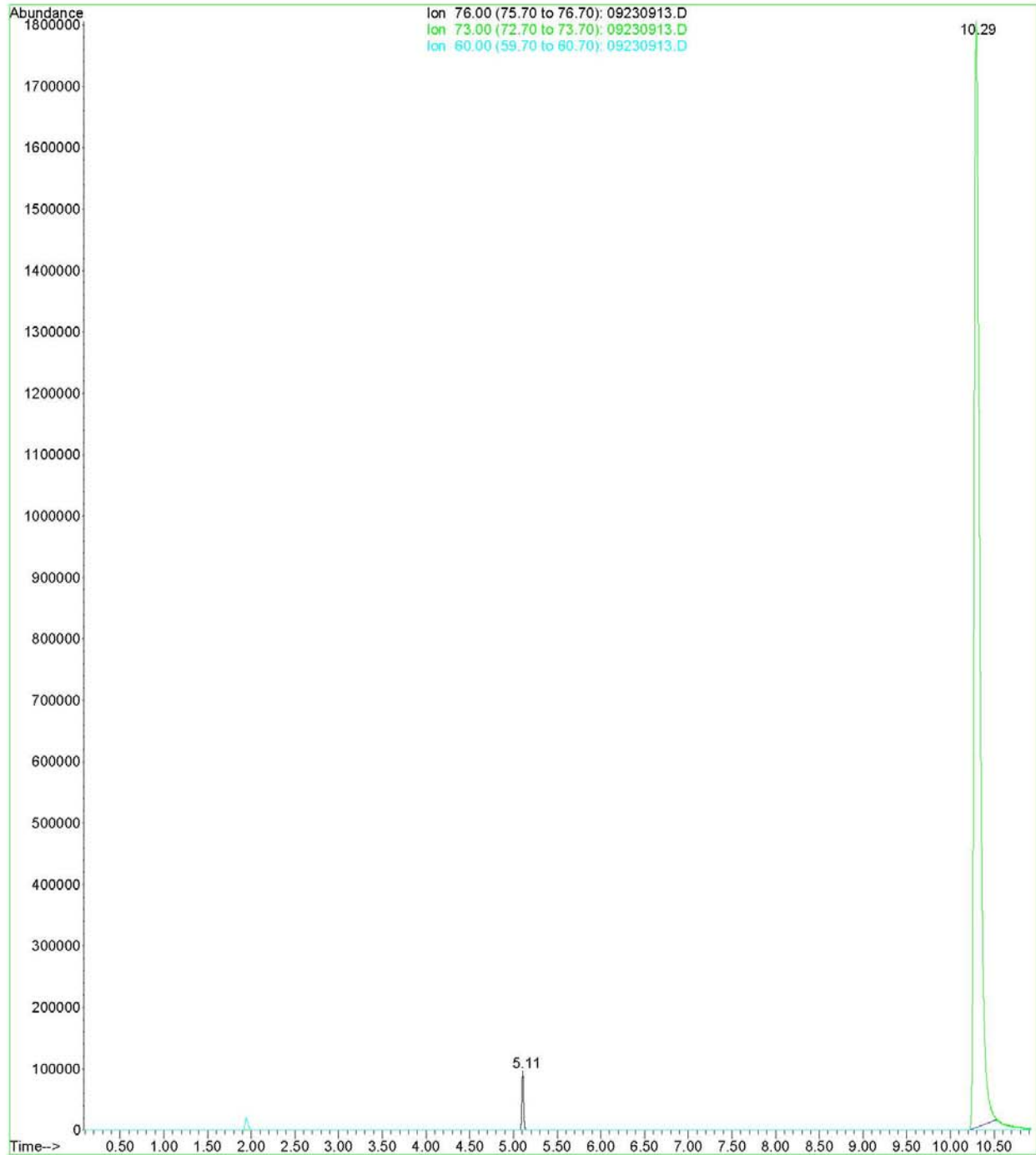
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 Sample : Negative Control Inst : Instrumen
 Misc : 3.20g Multiplr: 1.00
 MS Integration Params: EVENTS.E
 Quant Time: Sep 24 10:40:21 2009 Quant Results File: 092209CS2_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2_DRYWALL.M (Chemstation Integrator)
 Title :
 Last Update : Tue Sep 22 17:26:55 2009
 Response via : Initial Calibration
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
-----	-----	-----	-----	-----	-----	-----
1) MTBE	10.30	73	80396552	740.00	ng	-0.01
Target Compounds						Qvalue
2) Carbonyl sulfide	1.94	60	449031	Below	Cal	92
3) Carbon Disulfide	5.11	76	1315408	Below	Cal	97
-----	-----	-----	-----	-----	-----	-----

(#) = qualifier out of range (m) = manual integration (+) = signals summed
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Operator : JJ
Acquired : 23 Sep 2009 5:55 pm using AcqMethod 8260WALL
Instrument : Instrumen
Sample Name: Negative Control
Misc Info : 3.20g
Vial Number: 13



Quantitation Report

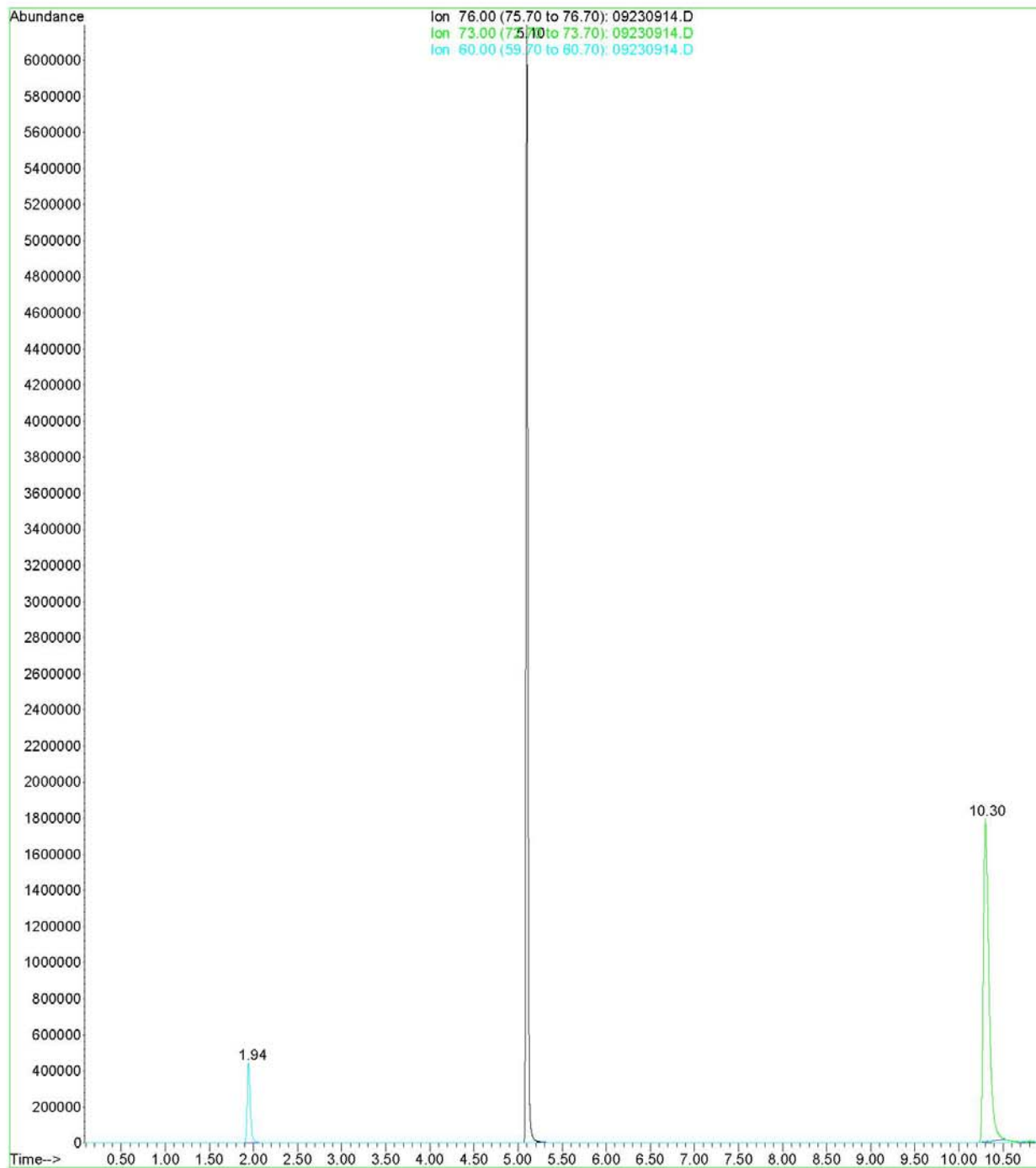
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 Sample : Positive Control Inst : Instrumen
 Misc : 3.10g Multiplr: 1.00
 MS Integration Params: EVENTS.E
 Quant Time: Sep 24 10:42:02 2009 Quant Results File: 092209CS2_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2_DRYWALL.M (Chemstation Integrator)
 Title :
 Last Update : Tue Sep 22 17:26:55 2009
 Response via : Initial Calibration
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) MTBE	10.30	73	78614807	740.00	ng	0.00
Target Compounds						Qvalue
2) Carbonyl sulfide	1.94	60	10888131	135.39	ng	100
3) Carbon Disulfide	5.10	76	95051217	842.91	ng	100

(#) = qualifier out of range (m) = manual integration (+) = signals summed
 09230914.D 092209CS2_DRYWALL.M Thu Sep 24 10:42:21 2009

File : C:\MSDCHEM\1\DATA\092309\09230914.D
Operator : JJ
Acquired : 23 Sep 2009 6:31 pm using AcqMethod 8260WALL
Instrument : Instrumen
Sample Name: Positive Control
Misc Info : 3.10g
Vial Number: 14



Quantitation Report

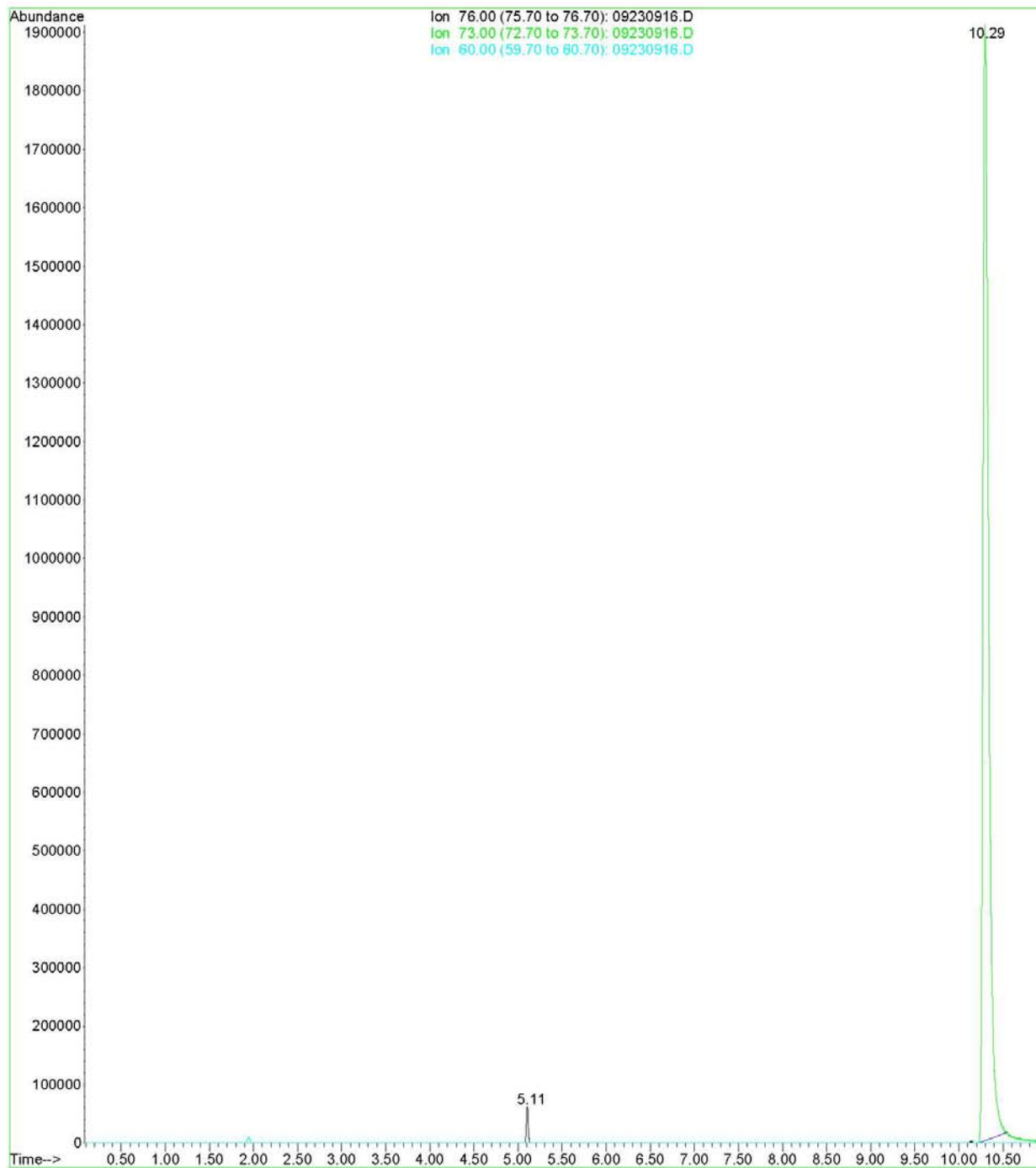
Data File : C:\MSDCHEM\1\DATA\092309\09230916.D Vial: 16
 Acq On : 23 Sep 2009 7:41 pm Operator: JJ
 Sample : M49785-001 Inst : Instrumen
 Misc : 3.19g Multiplr: 1.00
 MS Integration Params: EVENTS.E
 Quant Time: Sep 24 16:27:33 2009 Quant Results File: 092209CS2_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2_DRYWALL.M (Chemstation Integrator)
 Title :
 Last Update : Tue Sep 22 17:26:55 2009
 Response via : Initial Calibration
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) MTBE	10.30	73	84169837	740.00	ng	0.00
Target Compounds						
2) Carbonyl sulfide	1.94	60	200095	Below Cal	#	61
3) Carbon Disulfide	5.11	76	859673	Below Cal	#	92

(#) = qualifier out of range (m) = manual integration (+) = signals summed
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File : C:\MSDCHEM\1\DATA\092309\09230916.D
Operator : JJ
Acquired : 23 Sep 2009 7:41 pm using AcqMethod 8260WALL
Instrument : Instrumen
Sample Name: M49785-001
Misc Info : 3.19g
Vial Number: 16



Quantitation Report

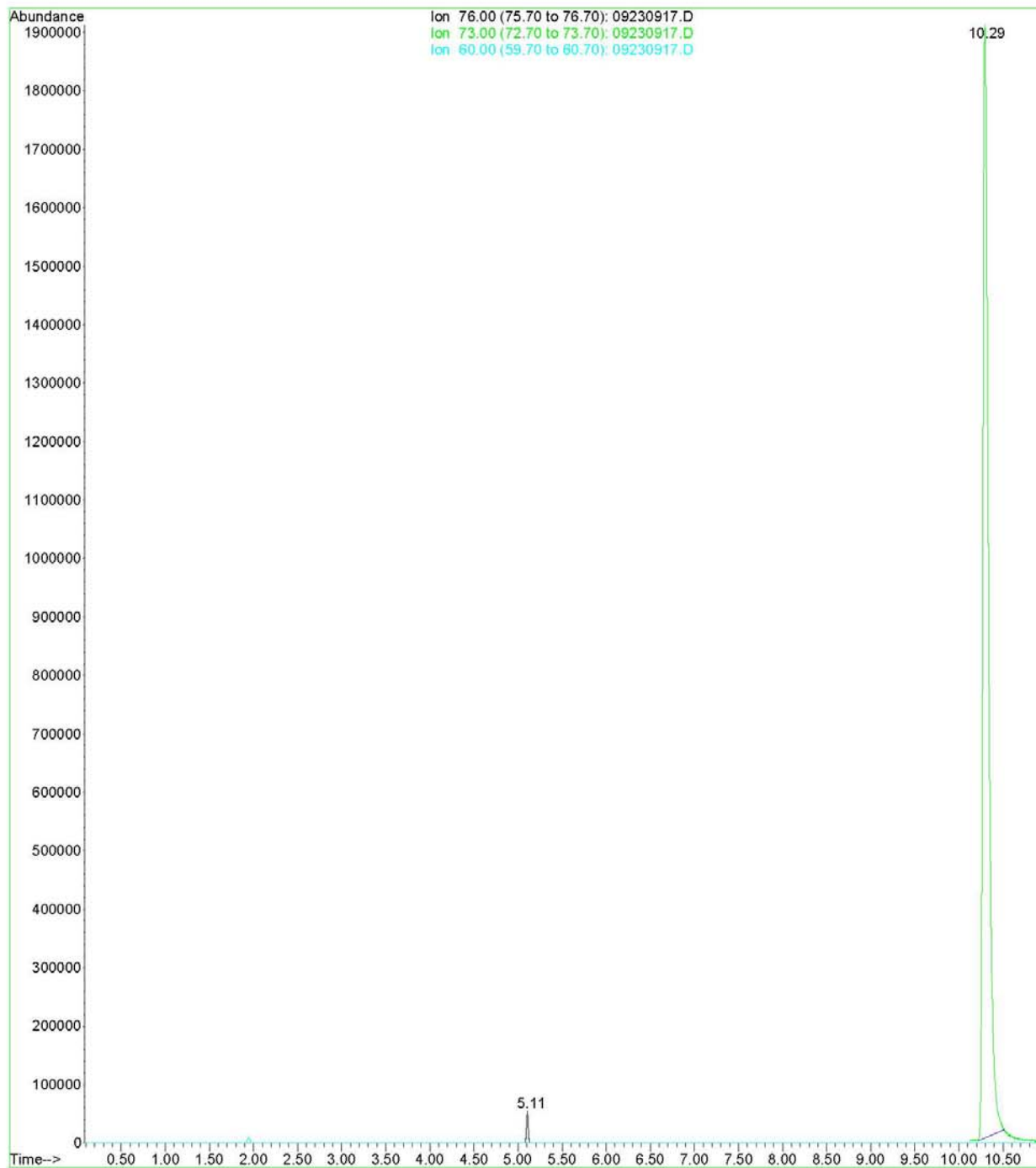
Data File : C:\MSDCHEM\1\DATA\092309\09230917.D Vial: 17
 Acq On : 23 Sep 2009 8:17 pm Operator: JJ
 Sample : M49785-002 Inst : Instrumen
 Misc : 3.16g Multiplr: 1.00
 MS Integration Params: EVENTS.E
 Quant Time: Sep 24 16:30:08 2009 Quant Results File: 092209CS2_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2_DRYWALL.M (Chemstation Integrator)
 Title :
 Last Update : Tue Sep 22 17:26:55 2009
 Response via : Initial Calibration
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) MTBE	10.30	73	83669983	740.00	ng	-0.01
						Qvalue
2) Carbonyl sulfide	1.95	60	178694	Below Cal	#	55
3) Carbon Disulfide	5.11	76	706437	Below Cal	#	75

(#) = qualifier out of range (m) = manual integration (+) = signals summed
 09230917.D 092209CS2_DRYWALL.M Thu Sep 24 16:30:08 2009

File : C:\MSDCHEM\1\DATA\092309\09230917.D
Operator : JJ
Acquired : 23 Sep 2009 8:17 pm using AcqMethod 8260WALL
Instrument : Instrumen
Sample Name: M49785-002
Misc Info : 3.16g
Vial Number: 17



Quantitation Report

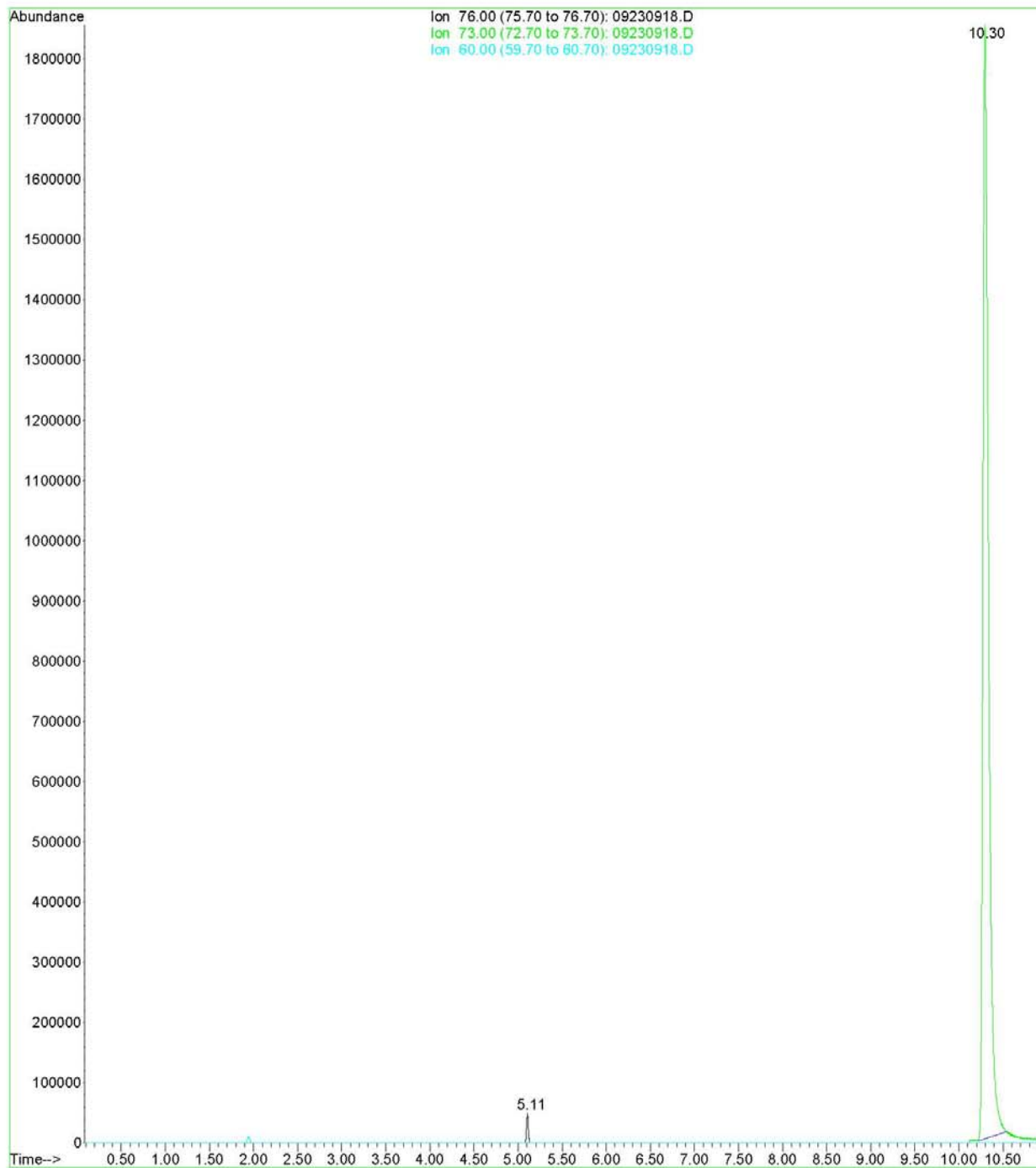
Data File : C:\MSDCHEM\1\DATA\092309\09230918.D Vial: 18
 Acq On : 23 Sep 2009 8:52 pm Operator: JJ
 Sample : M49785-003 Inst : Instrumen
 Misc : 3.04g Multiplr: 1.00
 MS Integration Params: EVENTS.E
 Quant Time: Sep 24 16:32:43 2009 Quant Results File: 092209CS2_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2_DRYWALL.M (Chemstation Integrator)
 Title :
 Last Update : Tue Sep 22 17:26:55 2009
 Response via : Initial Calibration
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
-----	-----	-----	-----	-----	-----	-----
1) MTBE	10.30	73	80147325	740.00	ng	-0.01
Target Compounds						Qvalue
2) Carbonyl sulfide	1.94	60	201158	Below Cal	#	72
3) Carbon Disulfide	5.11	76	642107	Below Cal	#	75
-----	-----	-----	-----	-----	-----	-----

(#) = qualifier out of range (m) = manual integration (+) = signals summed
 09230918.D 092209CS2_DRYWALL.M Thu Sep 24 16:32:43 2009

File : C:\MSDCHEM\1\DATA\092309\09230918.D
Operator : JJ
Acquired : 23 Sep 2009 8:52 pm using AcqMethod 8260WALL
Instrument : Instrumen
Sample Name: M49785-003
Misc Info : 3.04g
Vial Number: 18



Quantitation Report

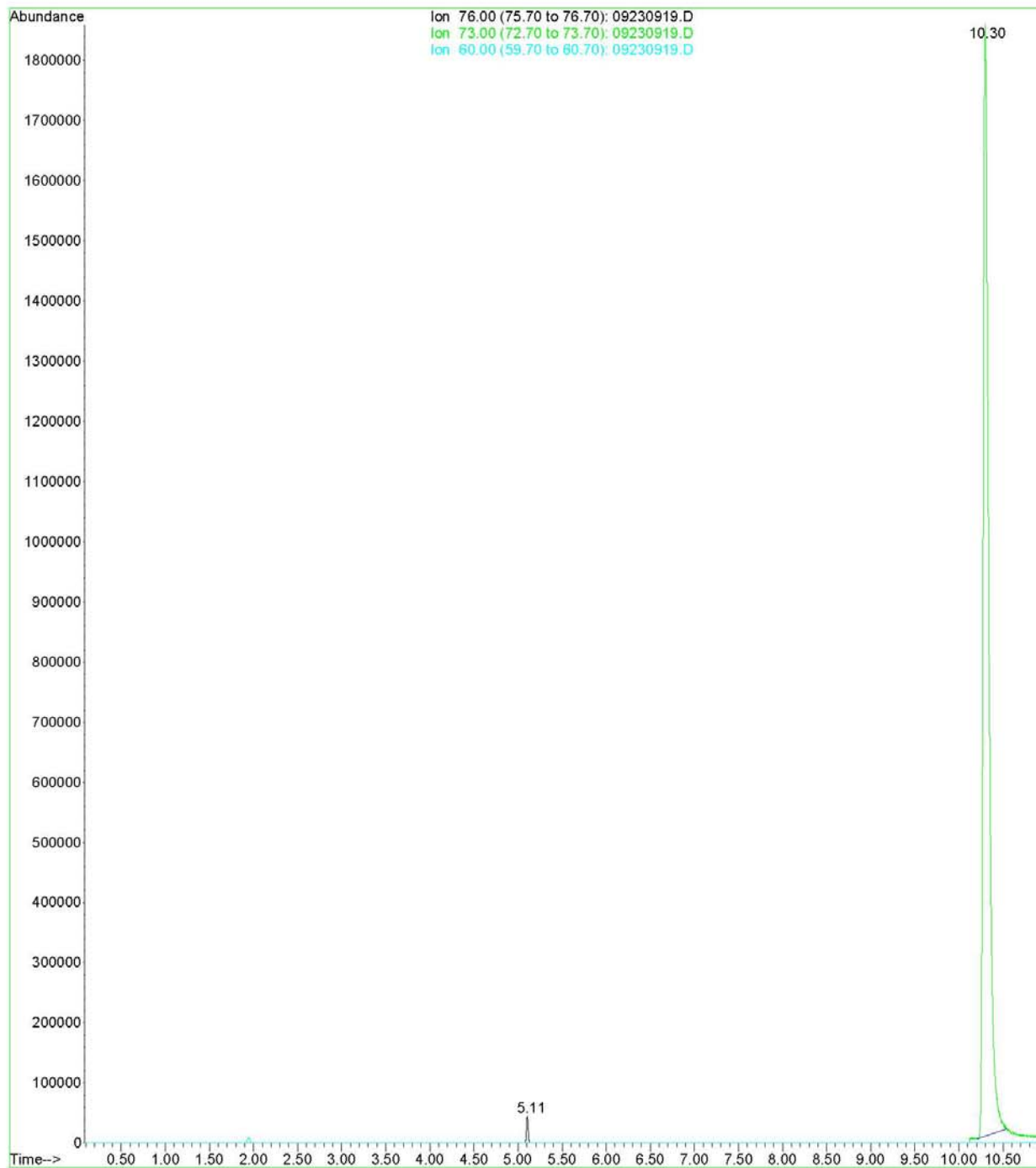
Data File : C:\MSDCHEM\1\DATA\092309\09230919.D Vial: 19
 Acq On : 23 Sep 2009 9:27 pm Operator: JJ
 Sample : M49785-004 Inst : Instrumen
 Misc : 3.05g Multiplr: 1.00
 MS Integration Params: EVENTS.E
 Quant Time: Sep 24 16:34:16 2009 Quant Results File: 092209CS2_DRYWALL.RES

Quant Method : C:\MSDCHEM\1...\092209CS2_DRYWALL.M (Chemstation Integrator)
 Title :
 Last Update : Tue Sep 22 17:26:55 2009
 Response via : Initial Calibration
 DataAcq Meth : 8260WALL

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) MTBE	10.30	73	79972723	740.00	ng	0.00
						Qvalue
2) Carbonyl sulfide	1.94	60	176186	Below Cal	#	1
3) Carbon Disulfide	5.11	76	577011	Below Cal	#	75

(#) = qualifier out of range (m) = manual integration (+) = signals summed
 09230919.D 092209CS2_DRYWALL.M Thu Sep 24 16:34:34 2009

File : C:\MTCHEM\1\DATA\092309\09230919.D
Operator : JJ
Acquired : 23 Sep 2009 9:27 pm using AcqMethod 8260WALL
Instrument : Instrumen
Sample Name: M49785-004
Misc Info : 3.05g
Vial Number: 19



CHAIN OF CUSTODY



Materials Analytical Services LLC
 3946 Lakefield Court
 Suwanee, Georgia 30024
 Phone: 770-866-3200
 Fax: 770-866-3259

Georgia Department of Public Health
Standard Method (Section 01360)
PRODUCT EMISSIONS TESTING
CHAIN OF CUSTODY

Client Information

Company: TEMPLE-INLAND (CUMBERLAND CITY)
 Street Address: 150 TEMPLE DRIVE
 City/State: CUMBERLAND CITY, TN
 Zip/Postal Code: 37050
 Country: USA
 Contact Name: BOB BERTOLAMI
 Title: QUALITY ASSURANCE MANAGER
 Phone Number: (931) 827-4547
 Fax Number: (931) 827-4560
 Email Address: robertbertolami@templeinland.com

Manufacturer Information (if different)

Company:
 City/State/Country:
 Contact Name/Title: SAME
 Phone Number:

Sample Details

Sample ID: 1/2" REG GYPSUM WALLBOARD
 Product Name: GYPSUM WALLBOARD
 Product Type: Ceiling/Wall Panels Flooring Trim Wall Paint Wall Coverings Thermal Insulation Furnishings (desks chairs other Other
 Date Manufactured: 9/13/09 or unknown inventory stock
 Warehouse Vendor Supplied
 Sample Collected by: QUALITY DEPT.
 Date & Time Collected: 9/14/09 2:00 AM
 Number of Sample Pieces: 4

Shipping Details

Packed By: BOB BERTOLAMI
 Shipping Date: 9/15/09
 Carrier/Airbill Number: FED EX

Specific Building Parameters (per CHPS)

Organization:
 City/State/Country:
 Office or School:
 Material exposed area (ft²):
 Building volume (ft³):
 Room floor area (ft²):
 Ceiling height (ft):

Furnishing Construction Details (as applicable)

Covering Type: Fabric (Primary Fiber type: _____), Vinyl Leather
 Polymer Type(s): Nylon PVC PE PP PU PS PC ABS Acrylic Lexan
 Substrate Type: MDF Particle Board Plywood Solid Wood (Type: _____)
 Finish Type: Oil Water Catalyzed Conversion Polyurethane Laminate Other
 Foam Type: Polyurethane Memory Latex Evlon High Resilience High Density
 Paint Type: Latex Oil Low VOC No VOCs PowderCoat

Notes or Comments from Manufacturer:

Laboratory Receipt (to be completed by Laboratory Representative)

Received By: Nancy Seak
 Received Date: 9-16-09
 Condition of Shipping Package: OK
 Condition of Sample: OK
 Remarks:

Sample Handling		Received By	Company	Date/Time
Relinquished By	<u>Bob Bertolami</u>	<u>Nancy Seak</u>	<u>MAS</u>	<u>9-16-09</u>
Company	<u>TEMPLE-INLAND (CUMBERLAND CITY)</u>			

-01