Air Liquide Electronics U.S. LP
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Work Order: **24-13903**
Revision: **0**
Report Date: **19-Dec-24**
Order Date: **16-Dec-24**
P.O.: **70340096**
Release: **.**
Approved By: **Han Steger**
Title: **Scientist, Organic Lab**

BALAZS TEST RESULTS

If you have any questions regarding the results, please call Lanny Huynh at Lan.Huynh@airliquide.com

Background and Summary:

On 12/18/2024, one HCl solution (Hydrochloric acid, LOT 120424123) was received from Italmatch Chemicals. The sample was extracted with hexane and the extracted solution was then analyzed by GC-MSD (Gas Chromatography with Mass Selective Detector) for qualitative and semi-quantitative analysis of extractable organic contaminants, and GC-FID (Gas Chromatography with Flame Ionization Detector) for quantitative determination of chlorobenzene.

Sample ID	Sample Mass (g)
LOT 120424123	32.97

Sample Preparation:

Approximately 30mL of sample was extracted with 3mL of hexanes. The extracted solution was concentrated to 1mL and spiked with a known volume of n-Hexadecane internal standard. The extract was analyzed by GC-MS and GC-FID.

A calibration curve for chlorobenzene ranging in concentration from 0.1 - 100 ppb was also run by GC-FID.

GC-FID Instrumentation:

The system used for the analysis was an Agilent 7890B GC with a FID. The GC-FID was equipped with a non-polar phase (dimethyl polysiloxane) capillary column. The following temperature program was used for

the GC: the oven was held at an initial temperature of 35°C for 5 minutes, ramped at a rate of 15°C/minute to 280°C and held at the final temperature for 20 minutes. The injection port was operated in splitless mode at a temperature of 250°C. The sample injection volume was 1.0 µL.

GC-FID Results:

Quantitative results: Quantitative amounts of the chlorobenzene were calculated using the calibration curve. Chlorobenzene was not detected at or above 10 ppbv. No other impurities were detected by this method.

GC-MS Instrumentation:

The system used for the analysis was an Agilent 7890B GC with a 5977 quadrupole MSD. The GC was equipped with a non-polar dimethyl polysiloxane phase capillary column. The following temperature program was used for the GC: the oven was held at an initial temperature of 35°C for 5 minutes, ramped at a rate of 15°C/minute to 280°C and held at the final temperature for 25 minutes. The injection port was operated in splitless and a temperature of 230°C. The sample injection volume was 1.0 µL.

Each compound passed down the GC column at a characteristic rate. As each compound exited the gas chromatograph, it entered the MSD where it was ionized using electron impact ionization (70 eV). The MSD collected a full mass spectrum (10-700 amu) approximately once per second.

GC-MS Results:

Identification of each compound detected was first attempted by searching a Wiley/ NIST library of nearly 900,000 mass spectra. In cases where no matches were found, the analyst interpreted the mass spectra to provide the best estimate of the most probable compound or class of compounds.
Labeled chromatograms are included in the report.

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Sample: 1475457 [LOT 120424123] **Site ID:** HCL

Component	Detection Limit	Result Value	Units
G0111-GCL-N-R-C Solvent (Mixture) Normalized Area % Assay by GC- FID			
Chlorobenzene	10	*	ppb

* = Analysis revealed that the analyte was not found at or about the detection limit

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Sample: 1476252 [BLANK HEXANES] Site ID: METHOD BLANK

Component	Detection Limit	Result Value	Units
G0111-GCL-N-R-C Solvent (Mixture) Normalized Area % Assay by GC- FID			
Chlorobenzene	10	*	ppb

* = Analysis revealed that the analyte was not found at or about the detection limit

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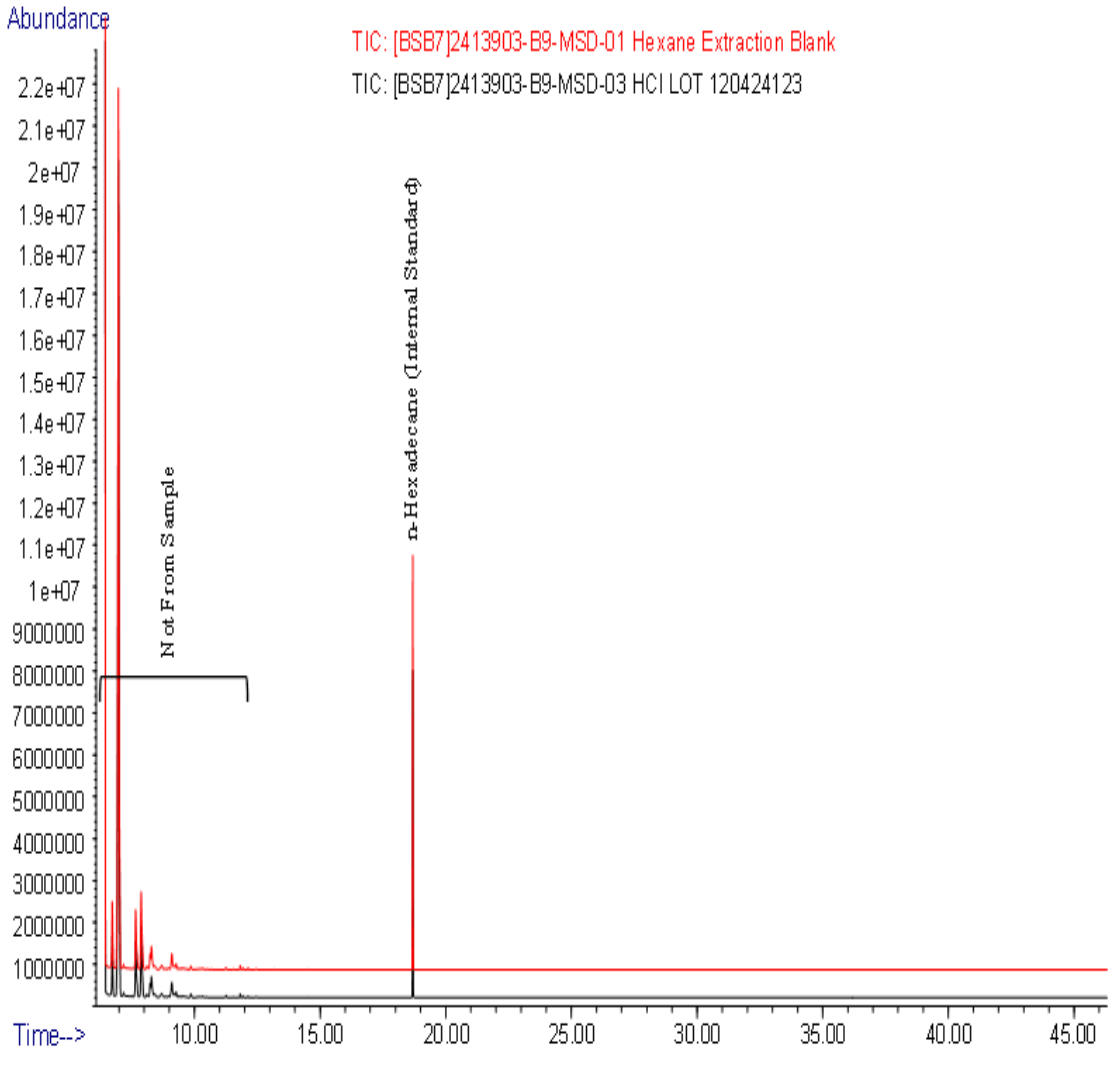
Figure 1: Chromatogram (Overlays-Full Scale)
Sample ID: Hexane Extraction Blank, HCl Lot 120424123
Method of Analysis: Liquid Injection-GC-MS (Gas Chromatography-Mass Spectrometry)
Sampling Conditions: Direct injection of hexane extract
Internal Standard: n-Hexadecane
Balazs Work Order: 24-13903



BALAZS™ nanoAnalysis
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Figure 2: Chromatogram (Overlays – Expanded/zoomed into impurities)
Sample ID: Hexane Extraction Blank, HCl Lot 120424123
Method of Analysis: Liquid Injection-GC-MS (Gas Chromatography-Mass Spectrometry)
Sampling Conditions: Direct injection of hexane extract
Internal Standard: n-Hexadecane
Balazs Work Order: 24-13903

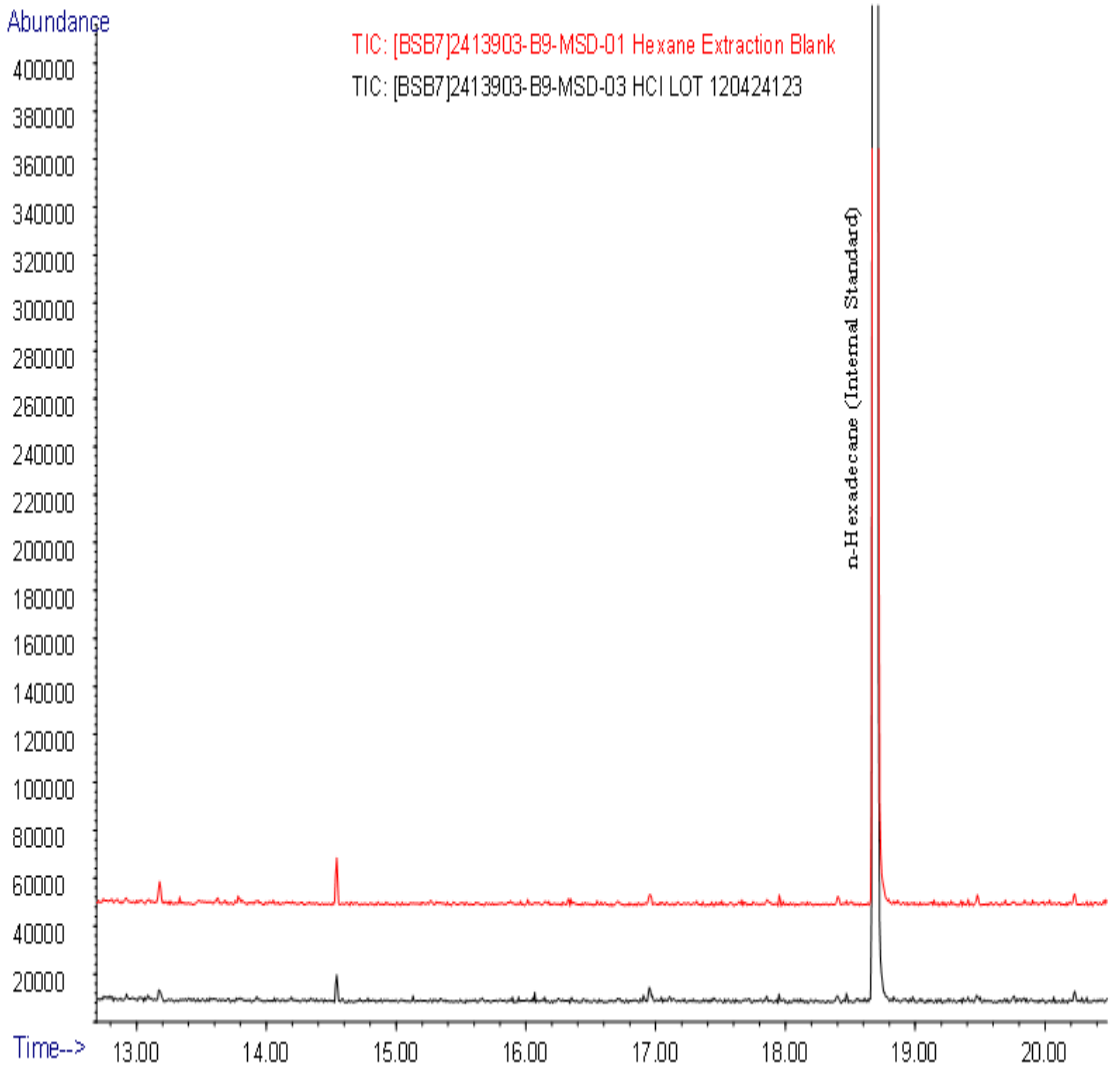

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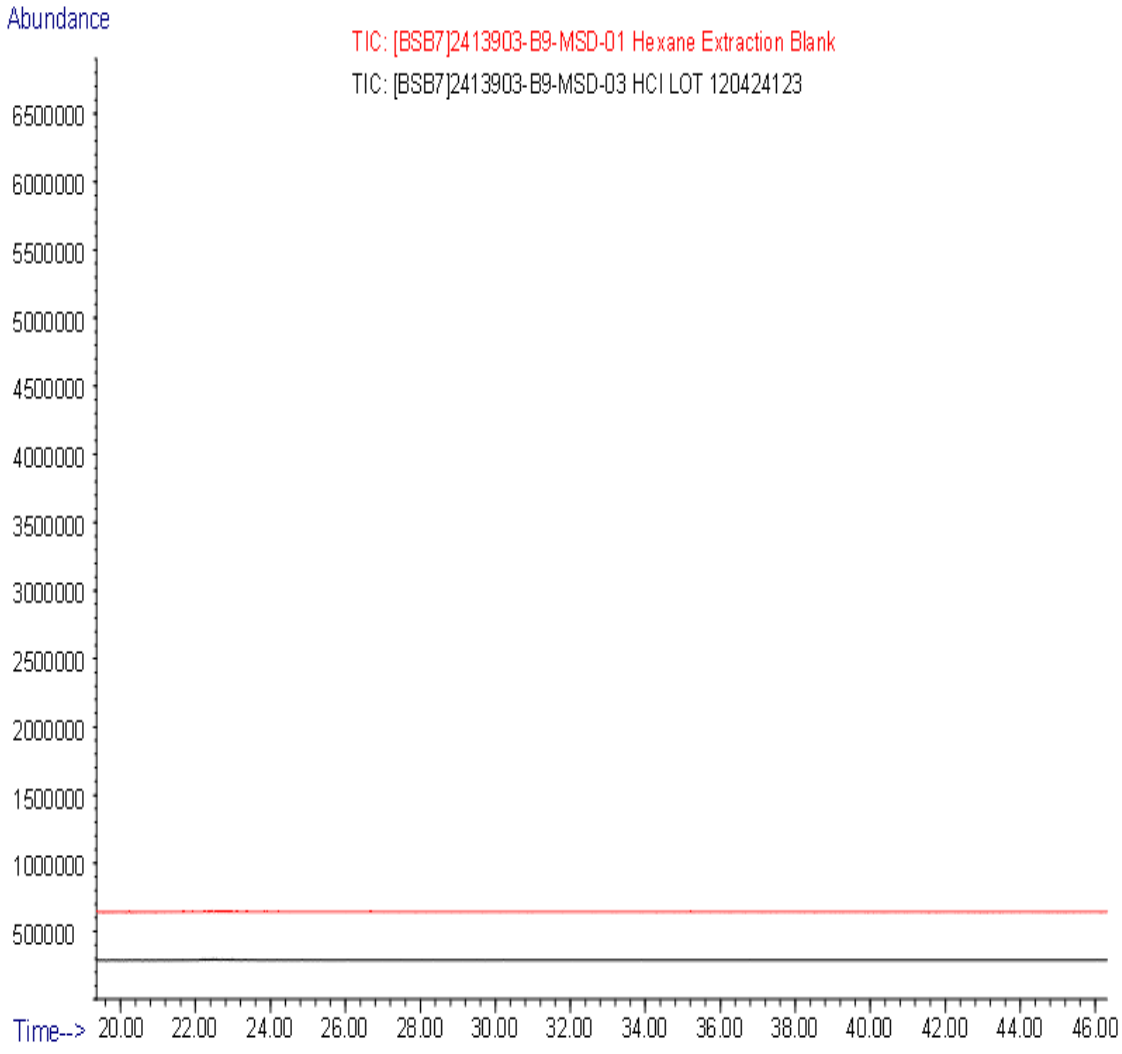
Figure 3: Chromatogram (Overlays – Expanded into impurities)
Sample ID: Hexane Extraction Blank, HCl Lot 120424123
Method of Analysis: Liquid Injection-GC-MS (Gas Chromatography-Mass Spectrometry)
Sampling Conditions: Direct injection of hexane extract
Internal Standard: n-Hexadecane
Balazs Work Order: 24-13903



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