

### ASTM D8098. Analysis of permanent gases in C2 and C3 Hydrocarbon Products by Gas Chromatography and Pulsed Discharge Helium Ionization Detection

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#### Introduction

The production of polymers requires a high grade of ethylene and propylene building blocks. To determine the purity of polymer grade ethylene and propylene Scion Instruments has developed a configuration that determines the trace impurities of permanent gases in C2 and C3 matrices.

This configuration will provide results according to ASTM D8098. This test method covers the determination of hydrogen, oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide in the parts per billion mole (nmol/mol) to parts per million mole ( $\mu\text{mol/mol}$ ) range in C2 and C3 hydrocarbons.

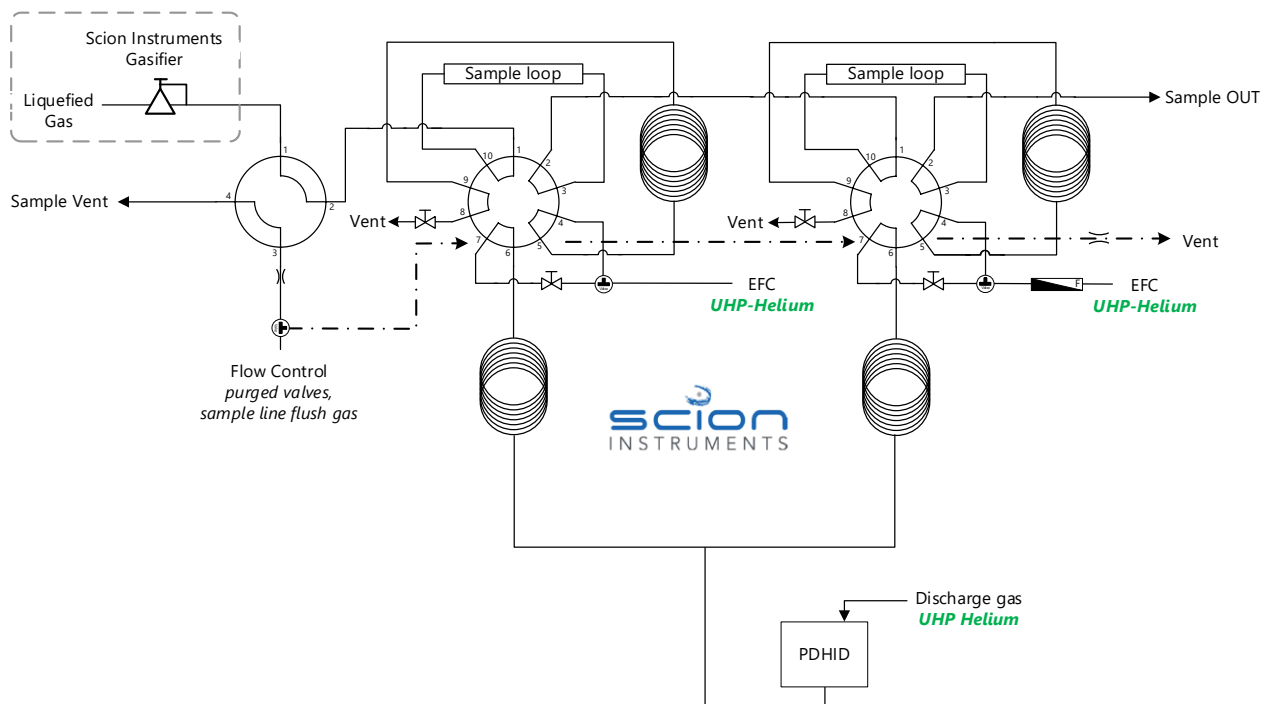
The instrument configuration consists of 2 channels. The first channel consists of a non O2 adsorbing pre-column and a molecular sieve column. The pre-column allows the complete elution of hydrogen, oxygen, nitrogen, methane and carbon monoxide onto the analytical column. All components heavier than these components (including CO2 and heavier) are backflushed to vent. The second channel consists of 2 porous polymer columns which separate a composite "air" peak (H2/O2/N2/ CO) from methane and CO2. All components heavier than CO2 are backflushed to vent.

Column dimensions are optimized for the combination of both channels onto one PDHID (PDD) detector.

Sample introduction is performed by the Scion Instruments integrated Gasifier. This device is capable of handling LPG samples of C2 through C4, effectively reducing the pressure resulting from gasifying the liquefied sample.

GC control and data handling was performed using Scion Instruments Compass CDS™.

#### System overview



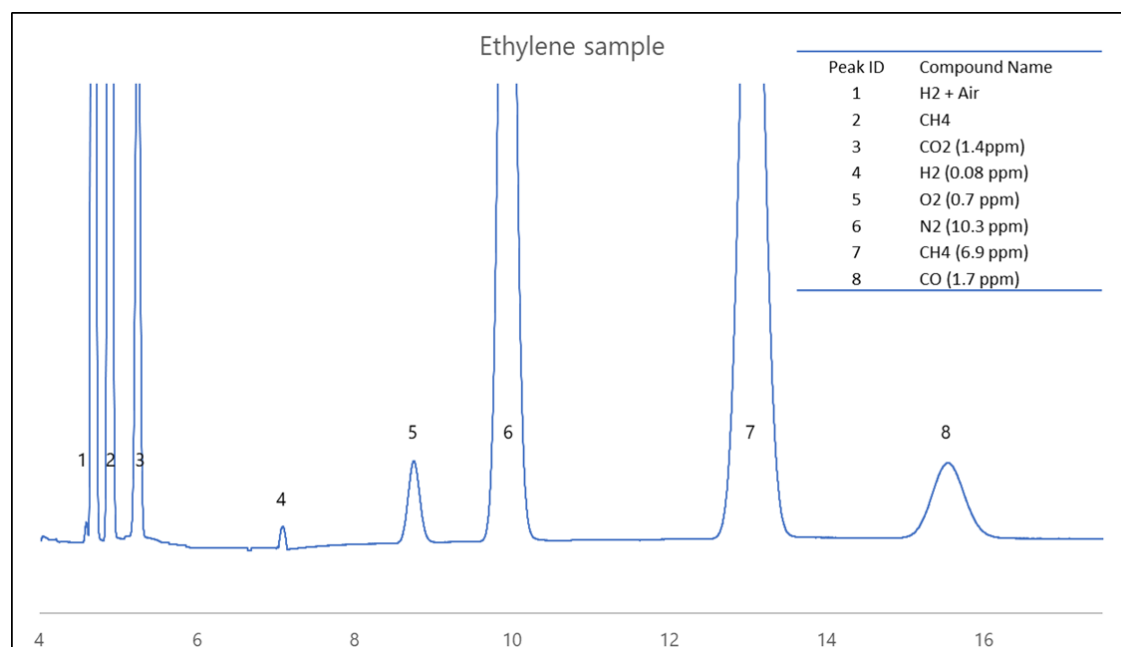
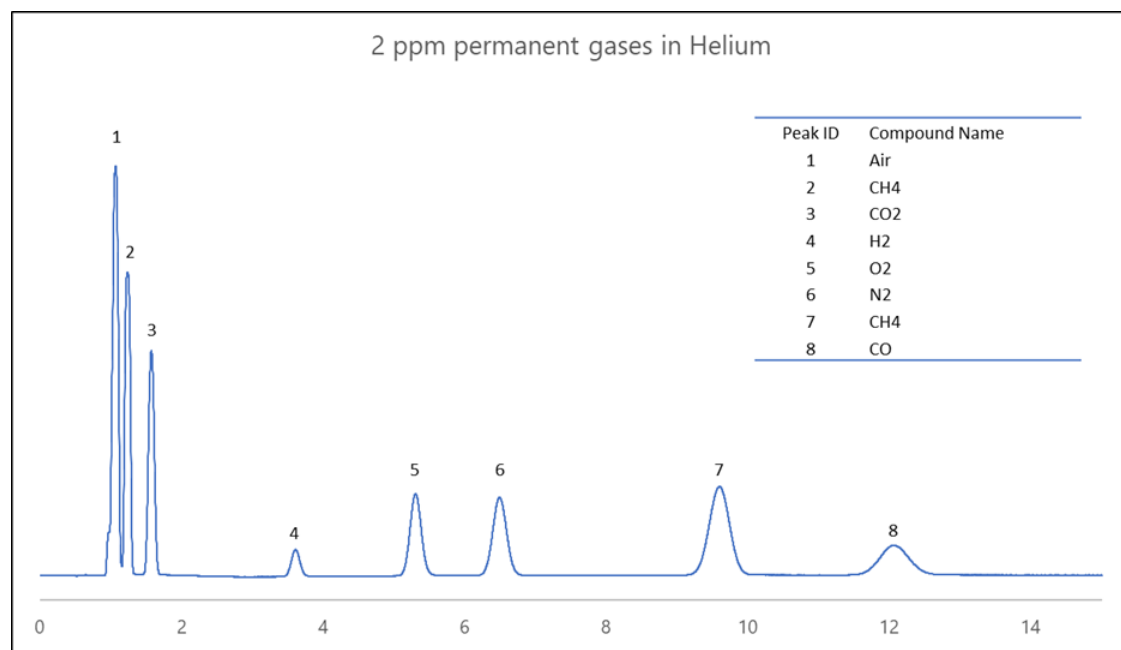
# APPLICATION NOTE

AN086

## Instrumental settings

Integrated Gasifier	120°C
Valve Oven	50°C
GC Oven	80°C isothermal for 18.50 minutes
Column Flows	15ml/min UHP Helium
Detector PDHID	120°C

## Chromatography



### Area Repeatability (n=20) 2 ppm permanent gas test mix

	Air	CH4	CO2	H2	O2	N2	CH4	CO
Mean	5008965	3393477	2652170	482111	1911297	2242025	3731809	1781911
Std Dev	2688.4	12845	9044	1530	2020	6512	12683	6580
Rsd %	0.05	0.38	0.34	0.32	0.11	0.29	0.34	0.37

### Method Detection Limit LOD-LOQ calculation

	Air	CH4	CO2	H2	O2	N2	CH4	CO
Mean	5008965	3393477	2652170	482111	1911297	2242025	3731809	1781911
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Rsd %	0.05	0.38	0.34	0.32	0.11	0.29	0.34	0.37
Amount test mix	PPM	2	2	2	2	2	2	2
LOD	PPB	20	20	17	6	16	19	20
LOQ	PPB	68	61	58	19	52	61	67

### Conclusion

As the results clearly show, this system is perfectly suited for the analysis of trace impurities in ethylene matrices. Detection limits are at ppb level, depending on the type of component. Due to the use of a gasifier and the backflush configuration, matrices of C3 and C4 could also be analyzed without difficulty.

The Scion Instruments D8098 configuration is perfectly suitable for the determination of permanent gas impurities in ethylene and propylene matrices at ppb levels. The use of robust industry standard inert materials, coupled with purged MS leak specification valves and inert preconditioned columns with welded ends ensures a robust instrument ideal for the olefin producing and the polymer industry.

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