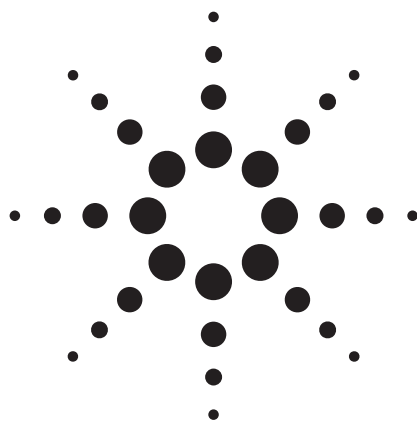




## Analysis of Polymer-Grade Monomers



**Turnkey configurations for  
gas chromatographic  
analysis, including  
instrumentation, methods,  
supplies and service.**



**Agilent Technologies**



**Agilent Technologies' analyzers for the hydrocarbon processing industry incorporate our extensive industry expertise in creating application-specific measurement solutions, based on standard or custom configurations of gas chromatographs, supplies, and methods, complemented by the specific knowledge of our channel partners.**

Producers of high purity monomers such as ethylene, propylene, and 1,3-butadiene face stiff competition and increasingly tight customer specifications. They are called on to test for more and more impurities at lower and lower detection limits, as buyers of these chemicals utilize more selective and sensitive polymerization catalysts. With the catalysts' susceptibility to poisoning and contamination, and the high cost of catalyst replacement and plant down time, impurity analysis becomes critical.

Chromatographs used for impurity analysis often carry the heaviest sample loads because of the information they produce.

Important benefits ensured by our systems include:

- A single system can analyze just about everything anyone would ever want to measure in one of these monomers, including difficult-to-analyze components like arsine and ammonia.
- Reliability
- Speed of analysis
- Resolution between components of interest
- System flexibility
- Guaranteed turnkey operation

Agilent Technologies analyzers for monomers are based on the 6890 gas chromatograph, with standard or customized subsystems and software optimized for this application. We have broad expertise in these analyses, and extensive experience in valved gas chromatography, with standard and customized configurations. Our capability is complemented by the industry-specific experience of our partner, Wasson-ECE, Inc. All systems use Windows®-based software, with full data handling capabilities to facilitate communication within laboratory and plant-wide data systems.

#### **Analysis Examples**

This booklet contains some examples of specific analyzer configurations. Many more are possible, including the one that will fit your particular analytical needs.



# Analysis of Impurities in Polymer-grade Ethylene and Propylene

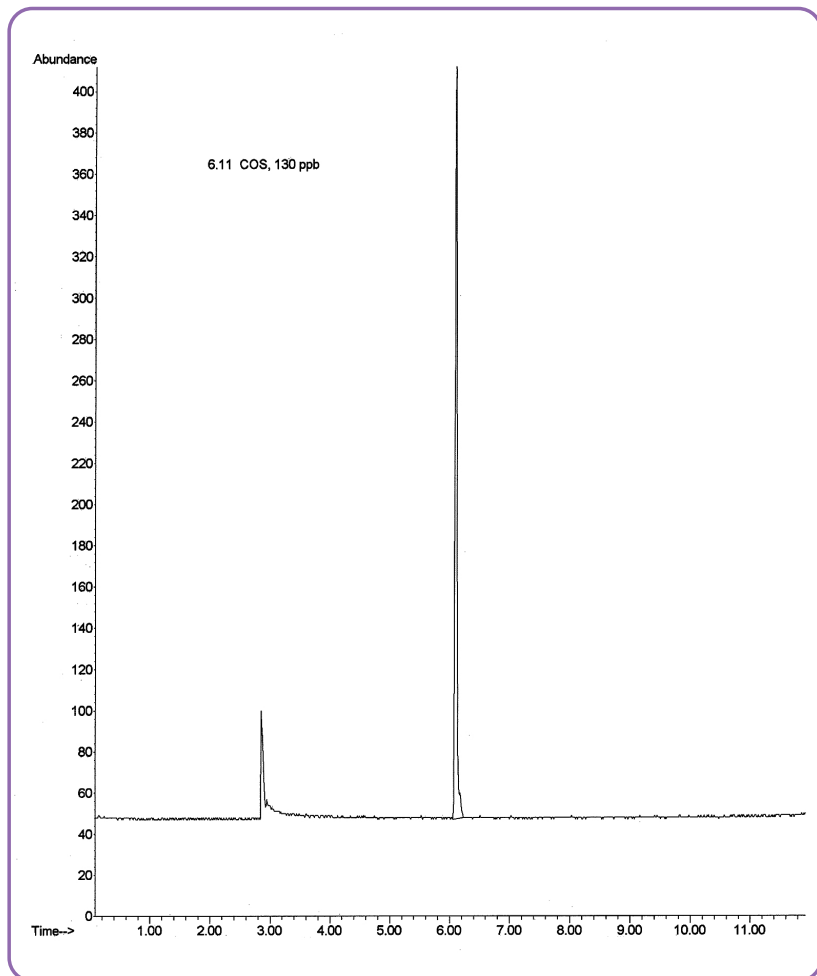
## Application 462B

### System Configuration

This system incorporates a mass selective detector (MSD) and a pulsed discharge helium ionization detector (PDHID). The MSD quantifies arsine, phosphine, water, ammonia, sulfurs, oxygenates, organochlorides, and any site-specific heavier molecules. The

PDHID quantifies low levels of hydrogen, oxygen, and nitrogen. This chromatographic system can analyze ethylene, propylene, or, if so configured, both. The complete sequence takes forty minutes. This configuration will quantify impurities in the following ranges:

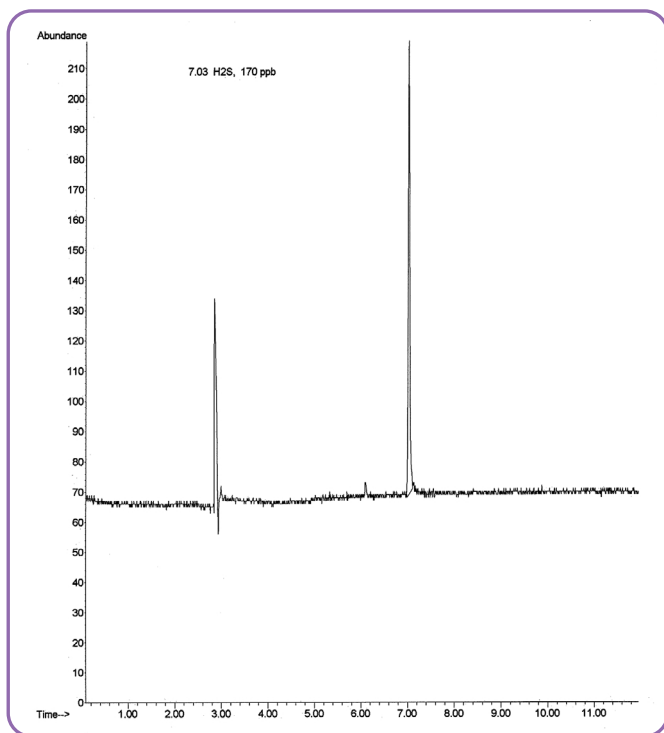
• Acetaldehyde	0.05-100 ppm
• Acetone	0.05-100 ppm
• Arsine	0.05-100 ppm
• Phosphine	0.05-100 ppm
• NH <sub>3</sub>	1-100 ppm
• H <sub>2</sub> S	0.01-100 ppm
• COS	0.01-100 ppm
• Methyl mercaptan	0.05-100 ppm
• Ethyl mercaptan	0.05-100 ppm
• Ethanol	0.05-100 ppm
• Methanol	0.05-100 ppm
• i-Propanol	0.05-100 ppm
• n-Propanol	0.05-100 ppm
• MTBE	0.05-100 ppm
• t-Butanol	0.05-100 ppm
• sec-butanol	0.05-100 ppm
• n-Butanol	0.05-100 ppm
• Water	1-100 ppm
• Methyl chloride	0.05-100 ppm
• Hydrogen	1-500 ppm
• Oxygen	1-500 ppm
• Nitrogen	1-500 ppm



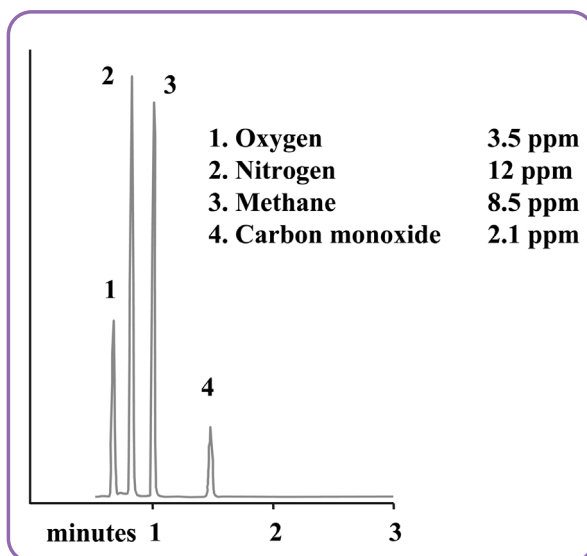


## Analysis of Impurities in Polymer-grade Ethylene and Propylene

### Application 462B



Application 462-00  
PDHID Chromatogram





# Analysis of Impurities in Polymer-grade Ethylene and Propylene

## Application 262

### System Configuration

This system is equipped with two flame ionization detectors (FID). One FID is associated with a set of columns to separate and detect paraffins and olefins in the C<sub>1</sub> to C<sub>5</sub> hydrocarbon range. The second FID is associated with a second set of columns and a methanizer to detect carbon monoxide and carbon dioxide. The system can address ethylene, propylene, or, if so configured, both. Samples are injected simultaneously into two parallel column trains plumbed to the two detectors; a single report results in twenty minutes. It is possible to implement one of two chromatographic methods for either ethylene or propylene with this configuration.

Method 1 performs the trace impurities analysis in polymer-grade ethylene.

#### FID 1 detects:

- CO 0.05-500 ppm
- CO<sub>2</sub> 0.05-500 ppm

#### FID 2 detects:

- Methane 1-5000 ppm
- Ethane 1-5000 ppm
- Propane 1-5000 ppm
- Propylene 1-5000 ppm
- Propadiene 1-5000 ppm
- Isobutane 1-5000 ppm
- Acetylene 1-5000 ppm
- n-Butane 1-5000 ppm
- Isobutylene 1-5000 ppm
- 1-Butene 1-5000 ppm
- t-2-Butene 1-5000 ppm
- cis-2-Butene 1-5000 ppm
- Methylacetylene 1-5000 ppm

Method 2 performs the trace impurities analysis in polymer-grade propylene.

#### FID 1 detects:

- CO 0.05-500 ppm
- CO<sub>2</sub> 0.05-500 ppm

#### FID 2 detects:

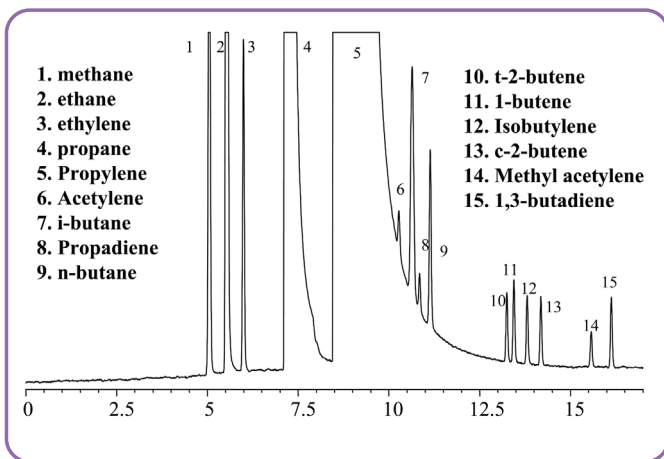
- Methane 1-5000 ppm
- Ethane 1-5000 ppm
- Ethylene 1-5000 ppm
- Propane 1-5000 ppm
- Isobutane 1-5000 ppm
- Acetylene 1-5000 ppm
- n-Butane 1-5000 ppm
- Propadiene 1-5000 ppm
- t-2-Butene 1-5000 ppm
- 1-Butene 1-5000 ppm
- Isobutylene 1-5000 ppm
- cis-2-Butene 1-5000 ppm
- Isopentane 1-5000 ppm
- Methylacetylene 1-5000 ppm
- n-Pentane 1-5000 ppm
- 1,3-Butadiene 1-5000 ppm



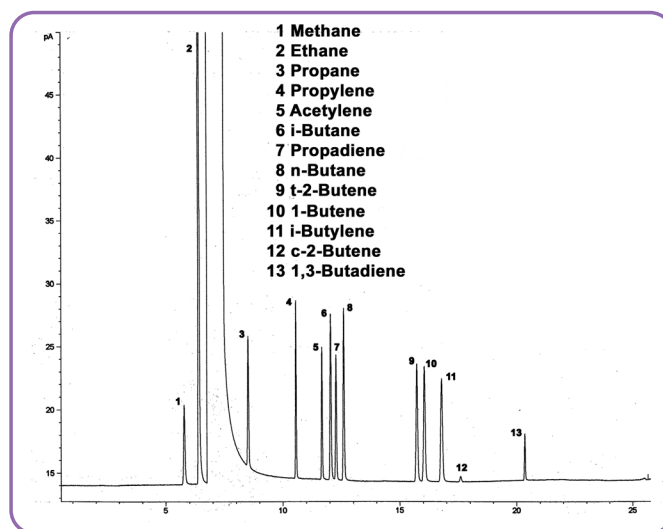
# Analysis of Impurities in Polymer-grade Ethylene and Propylene

## Application 262

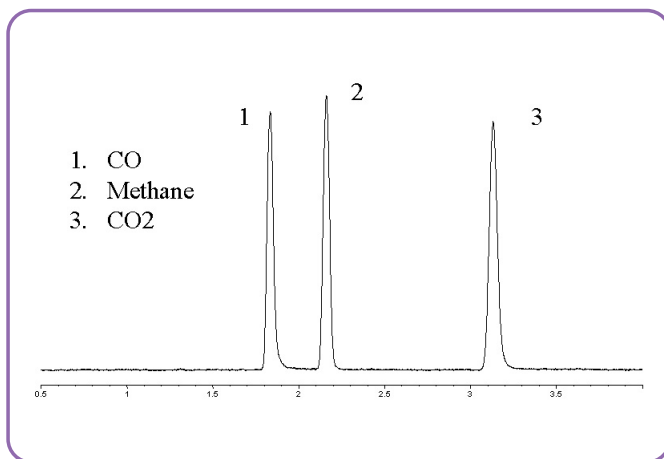
Impurities in Propylene by FID



Impurities in Ethylene by FID  
Approximately 30ppm each



Trace CO and CO<sub>2</sub> by Methanizer/AD





### **Industry-Specific Answers**

Take advantage of the industry expertise that's available to you from Agilent Technologies and our partners. We can provide the answer to your chemical analysis requirements.

### **Ask Agilent Technologies**

Let's talk about your analysis requirements for polymer-grade monomers. Contact your Agilent representative or authorized distributor. Or for more information, visit [www.agilent.com/chem](http://www.agilent.com/chem). Help us help you analyze your world.

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### **A Solution Partnership**

Agilent Technologies' channel partners complement our expertise in the hydrocarbon processing industry. Wasson-ECE is an Agilent Technologies Premier Solution Provider, a partnership that helps provide you with the most comprehensive analyzer solutions. Wasson's expertise in producing innovative solutions to support the hydrocarbon processing industry will greatly complement Agilent Technologies' products and knowledge.

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