RESTEK
Chromatography Products

Petrochemical Applications

17 Minute D2712 Analysis of Impurities in Propylene Using PLOT Columns

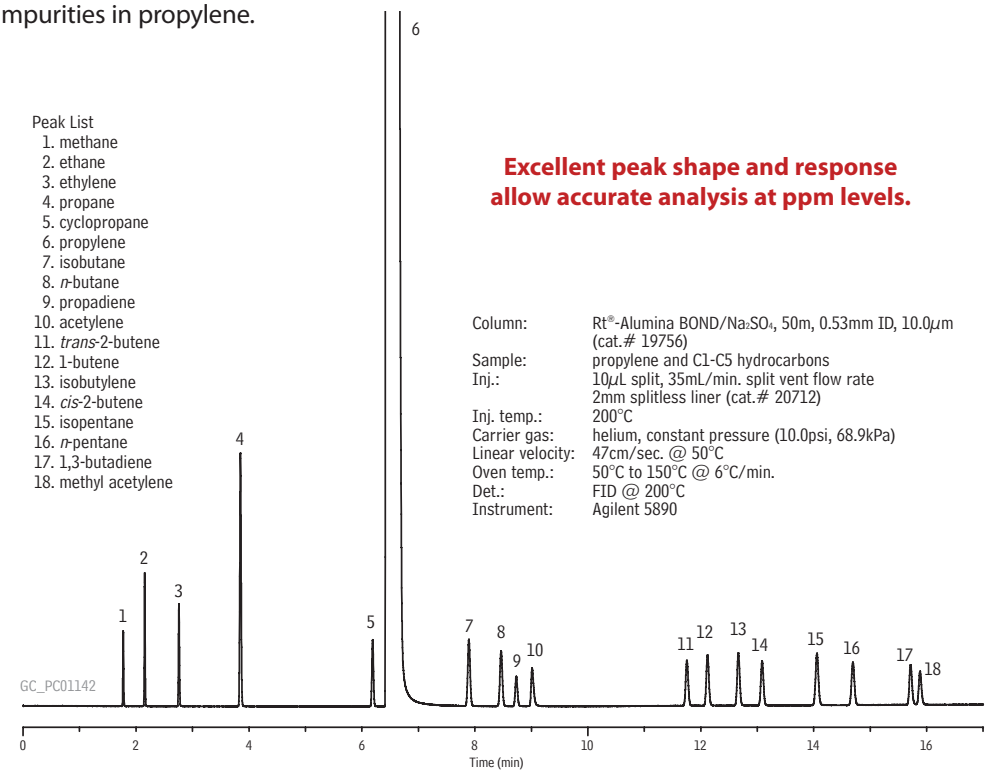
Propylene production exceeds that of most other hydrocarbons worldwide, as it is a key component in many hard plastics, primarily polypropylene, that are used in a broad spectrum of industries. Propylene can be generated by several methods, which utilize various catalysts to increase production efficiency. Methods include recovering propylene as a byproduct from the steam cracking of liquid feedstocks for ethylene production (e.g. naphtha), from the off-gases produced in fluid catalytic cracking units in refineries, or through direct methods, such as propane dehydration. Regardless of the production method, high purity product is extremely important to prevent damage to the catalysts used in production.

Purity often is determined using ASTM Method D2712, a gas chromatography method for determining part-per-million levels of hydrocarbon impurities in propylene concentrates. This test can be performed on any gas chromatographic system capable of detecting compounds at concentrations of at least 20ppm. While a wide variety of column choices are allowed by the method, the packed columns that are commonly used generally involve complex, multiple column setups, and often suffer from poorly resolved peaks or long run times.

Capillary PLOT columns can be an effective alternative to packed columns for propylene analysis; alumina PLOT columns, in particular, offer a high degree of selectivity for resolving low molecular weight hydrocarbons. Deactivation type can also enhance the separation between difficult to resolve compounds. Here, an Rt®-Alumina BOND column with a Na_2SO_4 deactivation was used to illustrate a simple single column setup that results in fast, baseline resolution of low molecular weight hydrocarbons from propylene.

Separation of the compounds typically encountered in a propylene stream is often difficult to achieve using packed columns. In contrast, all compounds are fully resolved on an Rt®-Alumina BOND/Na_2SO_4 PLOT column. These highly efficient columns provide excellent separation, even for difficult to resolve compounds like cyclopropane and propylene. The Rt®-Alumina BOND/Na_2SO_4 PLOT column also exhibits high capacity or loadability, as evidenced by the minimal amount of tailing on the propylene

Figure 1 Rt®-Alumina BOND columns provide fast, complete separation of hydrocarbon impurities in propylene.



peak. Improved peak shape for high concentration compounds minimizes the difficulty in identifying and quantifying other compounds that elute near the tailing edge of the major peak.

In addition to the complete separation of all compounds on a single column, another advantage of using the Rt®-Alumina BOND/Na_2SO_4 PLOT column is the fast analysis time than can be achieved. In comparison to packed column methods, which can require multiple columns and up to 45 minutes per run, the total run time using the Rt®-Alumina BOND/Na_2SO_4 PLOT column is only 17 minutes. High sample throughput is further supported by the short temperature program used here, as compared to some of the isothermal conditions and longer run times noted in the method.

In conclusion, the analysis of impurities in propylene can be significantly improved by using a single Rt®-Alumina BOND/Na_2SO_4 PLOT column instead of a multiple-column packed column setup. When testing for hydrocarbon impurities in propylene using ASTM D2712-91, the use of an Rt®-Alumina BOND/Na_2SO_4 column provides the greatest degree of separation in the least amount of time.

Rt®-Alumina BOND/Na_2SO_4 Columns
(fused silica PLOT) (Na_2SO_4 deactivation)

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- Predictable retention times run-to-run and column-to-column.
- No particle loss, due to unique bonding technology.

ID	df (µm)	temp. limits	length	cat. #
0.32mm	5	to 200°C	30-Meter	19757
0.32mm	5	to 200°C	50-Meter	19758
0.53mm	10	to 200°C	30-Meter	19755
0.53mm	10	to 200°C	50-Meter	19756

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Detectable gases:	helium, nitrogen, argon, carbon dioxide, hydrogen
Battery:	Rechargeable Ni-MH internal battery pack (6 hours normal operation)
Operating Temp. Range:	32°-120°F (0°-48°C)
Humidity Range:	0-97%
Warranty:	one year
Certifications:	CE, Ex, Japan
Compliance:	WEEE, RoHS

Gas	Minimum Detectable Leak Rate (atm cc/sec.)	Indicating LED Light Color
Helium	1.0×10^{-5}	red
Hydrogen*	1.0×10^{-5}	red
Nitrogen	1.4×10^{-3}	yellow
Argon	1.0×10^{-4}	yellow
Carbon Dioxide	1.0×10^{-4}	yellow

Description	qty.	cat.#
Leak Detector with Hard-Sided Carrying Case and Universal Charger Set (US, UK, European, Australian)	ea.	22839
Soft-Side Storage Case	ea.	22657
Small Probe Adaptor	ea.	22658

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