

Resolve Benzene and Toluene in Spark Ignition Fuels Containing Ethanol

Using a Modified ASTM D3606-10 Method D3606 Column Set



- ★ **Complete resolution of benzene from ethanol**—no compromising coelutions.
- ★ **Easy, accurate quantification of aromatics.**
- ★ **Fully conditioned column set.**
- ★ **Each set is tested for method applicability and includes chromatogram.**

Laboratories analyzing reformulated spark ignition fuels that contain ethanol for the determination of benzene and toluene must use a modified ASTM D3606-10 method to prevent the coelution of ethanol and benzene. This method modification is also a requirement of the U.S. EPA. The benzene range of determination is 0.1 to 5% by volume, and the toluene range is 2 to 20% by volume. The primary challenge in this analysis is twofold: the tailing of the ethanol peak, and the retention time shift of the aromatics towards ethanol, specifically benzene merging quickly into the ethanol peak and preventing accurate quantification.

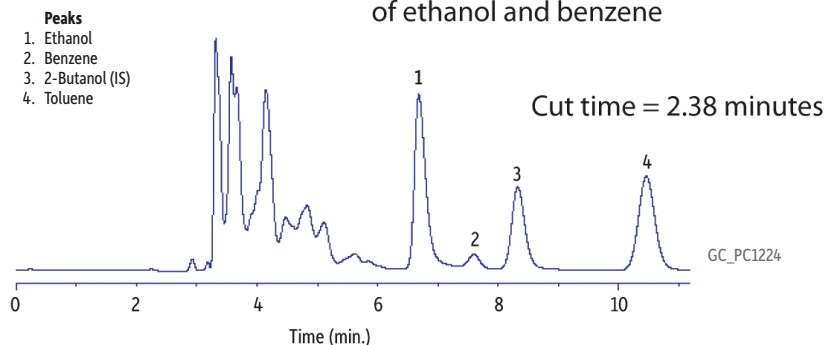
Restek has resolved these issues by developing a D3606 column set for this modified ASTM D3606-10 application. Column 1 is a 6' x 1/8" nonpolar Rtx®-1 phase, which separates components by boiling point. After the elution of *n*-octane (C8), Column 1 is backflushed to prevent heavier compounds from entering Column 2, the main analytical column. The light compounds pass into Column 2, a 16' x 1/8" column packed with a proprietary polymer that fully resolves the aromatics compounds.

To demonstrate the performance of this column set, a gasoline sample was analyzed using a GC equipped with a thermal conductivity detector (TCD). Helium was used as the carrier gas at 20 mL/min. in the constant flow mode. The data in Figure 1 show that the aromatic compounds are fully resolved, and can easily be quantified using the internal standard, 2-butanol.

This column set is fully conditioned. Only a brief (10 min.) carrier gas purge at ambient temperature, followed by a 1 hour hold at 165 °C, is required. If your laboratory has been struggling with ASTM method D3606-10 for reformulated fuels containing ethanol, Restek's column set is the solution.

Gasoline Containing Ethanol on D3606 Application Column Set by ASTM D3606-10 (Modified)

Excellent separation of ethanol and benzene



Column D3606 application column (2 column set). Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, nonpolar Rtx®-1; Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material (cat.# 83606-800) Ethanol-containing gasoline with internal standard (IS)

Sample Diluent: sample valve

Injection Sample Loop Vol.: 1.5 µL
Valve Temp.: 150 °C

Oven Oven Temp.: 135 °C (hold 12 min.)

Carrier Gas He, constant flow

Flow Rate: 20.0 mL/min.

Detector TCD @ 200 °C

Notes 2.38 minute backflush (must be determined for each GC system).

D3606 Application Column (2 column set)

Description	cat.#*
D3606 Application Column (2 column set)**	
Column 1: 6' (1.8m), 1/8" OD, 2.0mm ID, nonpolar Rtx-1	83606-
Column 2: 16' (4.9m), 1/8" OD, 2.0mm ID, proprietary packing material	

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.

**The column set is designed to accommodate both valve injection and/or syringe injection. Column 1 is configured with a 2" inlet void to facilitate on-column injection. The inlet is identified on both column 1 and column 2. Note: The inlet of column 2 is identified for proper orientation for connection to the valve.

Visit www.restek.com/D3606standards for a list of our certified reference materials.

Column Configurations



General Configuration
Suffix -800



Agilent
5880, 5890,
5987, 6890,
7890:
Suffix -810*



Varian 3700,
Vista Series,
FID:
Suffix -820



PE 900-3920
Sigma 1,2,3:
Suffix -830



PE Auto System
8300, 8400,
8700:
Suffix -840

See our website for custom configurations

Note: Initial 2" of column will be empty, to accommodate a needle. For a completely filled column (not on-column) add suffix -901.

*-810 suffix also includes 1 1/2" void on detector side.

Visit www.restek.com/petro for more products and technical resources.

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Lit. Cat.# PCTS1408-UNV