



introducing

Rtx[®]-TNT/TNT2

capillary columns

from **RESTEK**

Rtx[®]-TNT/TNT2 Columns

Revolutionary Dual-Column System Designed for Explosives Analysis



- ✓ Provides baseline resolution of nitroaromatic compounds such as those listed in US EPA Method 8095.
- ✓ Confirmation column achieves 8 elution order changes under the same GC oven conditions.
- ✓ High thermal stability for low ECD bleed.
- ✓ Available in economical 3-packs.

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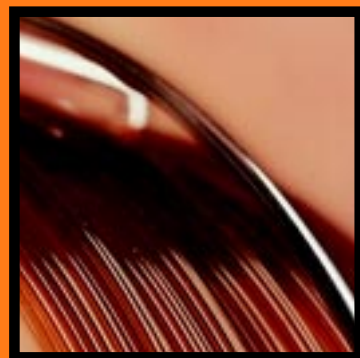
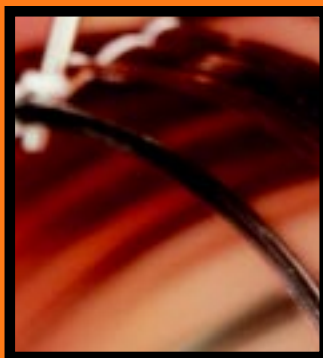
What are the challenges in explosives analyses?

The standard environmental test method for nitroaromatic, nitramine, and nitroester analyses uses high performance liquid chromatography (HPLC) separation and detection by ultra-violet absorption [US Environmental Protection Agency (EPA) Method 8330]. Unfortunately, this method typically results in high solvent usage, multiple coelutions, and long analysis times. Analysts have been interested in developing a gas chromatographic (GC) method that overcomes the disadvantages of the current HPLC method.

A GC/electron capture detection (ECD) alternative to the HPLC Method has been drafted by the US EPA (Method 8095). This new GC/ECD method includes all of the Method 8330 target compounds plus 3,5-dinitroaniline, nitroglycerine, and pentaerythritol tetranitrate (PETN). To address the requirements of this new method, Restek has designed the Rtx[®]-TNT and Rtx[®]-TNT2 dual-column system.

What is the benefit of using the Rtx[®]-TNT and Rtx[®]-TNT2 dual-column system?

Restek has designed the Rtx[®]-TNT and Rtx[®]-TNT2 columns specifically to analyze nitroaromatic compounds by GC/ECD. The TNT columns provide better resolution and higher thermal stability than any of the columns currently recommended in Method 8095. The Rtx[®]-TNT primary column and Rtx[®]-TNT2 confirmation column operate under identical GC oven temperature programs, allowing simultaneous dual-column confirmational analysis of all 16 nitroaromatic compounds.



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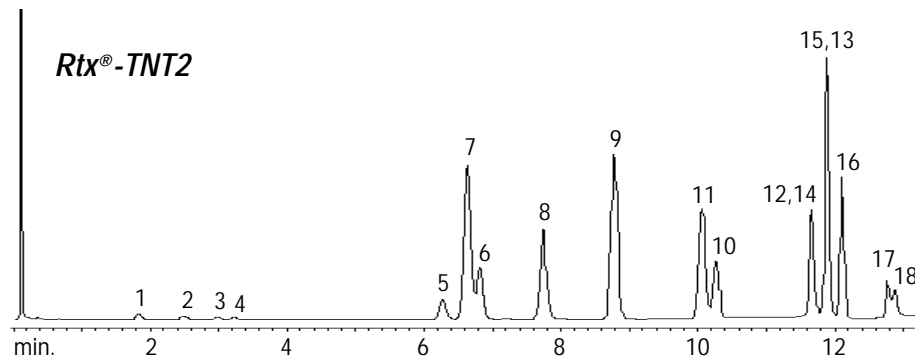
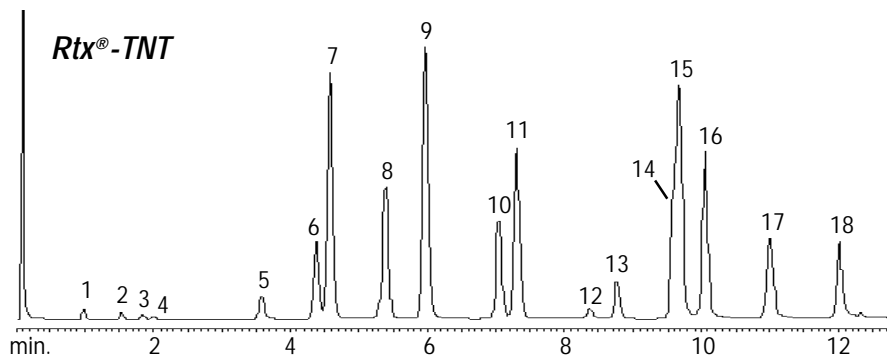


Optimized Column Set Provides Excellent Resolution of Nitroaromatic Compounds

Column stationary phase, dimensions, and injection technique must all be optimized to ensure the best chromatographic performance of nitroaromatic compounds. Typically a 100% dimethyl polysiloxane (Rtx[®]-1) column is used as the primary column for explosives analysis, and either a 100% trifluoropropyl polysiloxane (Rtx[®]-200) or a 50% cyanopropylmethyl/50% phenylmethyl polysiloxane (Rtx[®]-225) column is used for confirmation. Each of these phases suffer from distinct disadvantages with this analysis, such as coelutions, long analysis times, and poor analyte response. The Rtx[®]-TNT/Rtx[®]-TNT2 columns are optimized with a 6-meter length, 0.53mm ID, and 1.5µm film thickness. The 6-meter length minimizes surface area/contact times to improve the response of thermally labile explosives, such as cyclotetramethylene tetranitramine (HMX). The 0.53mm ID permits a direct injection to minimize injection port discrimination, sample adsorption, and low response. A 1mm Siltek[™] Uniliner[®] inlet liner is recommended for the best inertness and response of nitroaromatic compounds. The 1.5µm film thickness provides the required separation of the explosives, while maintaining fast run times and low ECD bleed. Combined optimization, from injector to column dimensions, results in the most reproducible explosives analysis.

Figure 1

Rtx[®]-TNT and Rtx[®]-TNT2 columns provide the best resolution of nitroaromatic explosive compounds in under 13 minutes.



Conditions for Figure 1

6m, 0.53mm ID, 1.50µm Rtx[®]-TNT (cat.# 12998) and 6m, 0.53mm ID, 1.50µm Rtx[®]-TNT2 (cat.# 12999). Direct injection using a 1mm Siltek[™] Uniliner[®] (cat.# 21052-214.1).
On-column conc.: 200-1000pg/compound. 8095 Calibration Mix A (cat.# 31607), 8095 Calibration Mix B (cat.# 31608), and 3,4-dinitrotoluene (cat.# 31452).
Oven temp.: 80°C (hold 1 min.) to 180°C @ 10°C/min. to 300°C @ 30°C/min. (hold 3 min.); **Inj. temp.:** 250°C;
Det.: ECD @ 330°C with anode purge; **Dead time:** 4.4 sec.;
Head pressure: He @ 3psi (20.7 KPa);
Flow rate: He @ 17mL/min. @ 80°C.

Peak List for Figure 1

1. nitrobenzene
2. 2-nitrotoluene
3. 3-nitrotoluene
4. 4-nitrotoluene
5. nitroglycerine
6. 1,3-dinitrobenzene
7. 2,6-dinitrotoluene
8. 2,4-dinitrotoluene
9. 3,4-dinitrotoluene (IS)
10. 1,3,5-trinitrobenzene
11. trinitrotoluene
12. PETN
13. RDX
14. 4-amino-2,6-dinitrotoluene
15. 3,5-dinitroaniline
16. 2-amino-4,6-dinitrotoluene
17. tetryl
18. HMX

Rtx[®]-TNT/TNT2

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Rtx[®]-TNT & Rtx[®]-TNT2 Columns

Column	ID	df (µm)	Temp. Limits	6-Meter
Rtx [®] -TNT	0.53mm	1.50	-20 to 300/310°C	12998/3-pk.
Rtx [®] -TNT2	0.53mm	1.50	-20 to 300/310°C	12999/3-pk.

1mm Siltek[™] Uniliner[®]

This Uniliner[®] inlet liner was designed specifically for the HP-5890 split/splitless injection port. It is recommended for the US EPA Method 8095 analysis of explosive extracts in acetonitrile by direct injection onto 0.53mm ID columns. In this application, analysts can expect reduced peak width as compared to the standard 4mm ID Uniliner[®] inlet liners. The 1mm Siltek[™] Uniliner[®] also works in HP-6890 GCs.

1mm Siltek [™] Uniliner [®] Inlet Liner	
cat.# 21052-214.1 (ea.)	cat.# 21053-214.5 (5-pk.)

Leak Detective[™] Electronic Leak Detector

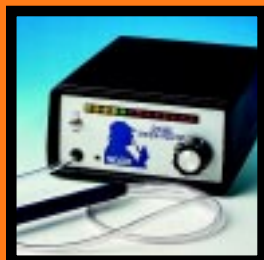
- Detects helium or hydrogen trace leaks at $\geq 3 \times 10^{-4}$ cc/sec. or ≥ 200 ppm.
- Compact, lightweight, hand-held design.

Restek's Leak Detective[™] electronic leak detector is the convenient and affordable solution for GC leak detection. It responds in less than 2 seconds to trace leaks of gases with thermal conductivities different than air. Operates on two 9-volt batteries or with an AC adaptor (batteries and adaptor included).

Leak Detective [™]	
cat.# 21607 (110 v)	cat.# 21609 (220 v)

Analytical Reference Materials

Restek manufactures calibration mixtures for US EPA Method 8095 GC explosives, Method 8330 HPLC explosives, and other explosives analysis. Please contact our technical service team at 800-356-1688 or 814-353-1300, ext. 4, or call your local Restek representative, for details on these standards.



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