

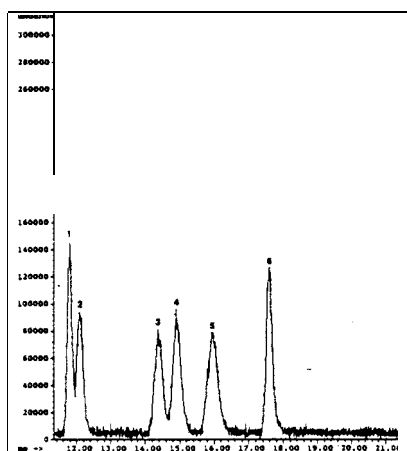
THE RESTEK ADVANTAGE

Rtx-200 - Methyl Trifluoropropyl The Most Versatile Stationary Phase on the Market

- **360°C** thermal stability
- low bleed with FIDs, ECDs, and MSDs
- selective for lone pair electron functionalities
- available in thin and thick films
- ideal confirmation column for many EPA analyses

Trifluoropropyl stationary phases have unique selectivity due to the electrophilic nature of the fluorine atom in the polymer backbone. This creates interactions with compounds that contain groups displaying lone pair electrons. Lone pair electrons are commonly found in alcohols, ketones, and nitro-containing compounds. Molecules which are electron rich, such as Freon, tend to be retained preferentially by the same mechanism as described above. This unique selectivity switches

Figure 1 - Freon analysis on Rtx-200 does not require sub-ambient cooling.



1. Dichlorofluoromethane (Freon 21)
2. Fluorotrichloromethane (Freon 11)
3. 2,2-dichloro-trifluoroethane (Freon 123)
4. 1,1-dichloro-1,1,2-trifluoroethane (Freon 123a)
5. 1,1,2-trichlorotrifluoroethane (Freon 113)
6. Dichloromethane

105m, 0.53mm ID, 3.0µm Rtx-200 (cat.# 15091).
1.0µl injection of Freons 500µg/ml concentration
Oven temp.: 35C isothermal
Inj. & det. temp.: 220°C Det.: MS (TIC)
Carrier gas: Helium Interface: Open split
Splitless hold time: 1.5 min. Inj. mode: Splitless
Linear velocity: 20cm/sec.

elution orders and resolves compounds that phenyl, cyano, and Carbowax containing phases cannot resolve. While trifluoropropyls have been recognized for their unique selectivity, they have also suffered from low thermal stability, high bleed, and poor inertness. Restek's new Rtx-200 solves these problems and expands the utility of trifluoropropyl phases. The Rtx-200 is ideal for a wide variety of applications such as Freons, phenols, polynuclear aromatics (PNAs), herbicides, and solvents. Thermal stability is exceptional at 360°C, bleed is low, even on Halogen specific detectors such as ECDs, and the inertness is superior, even for active compounds such as phenols.

APPLICATIONS

Freon Analysis

With the growing concern over ozone depleting chemicals such as chlorofluorocarbons (CFCs), strong emphasis has been placed on the analysis of Freons in the environment. The Rtx-200 is an excellent column for Freon analysis. The trifluoropropyl content of the Rtx-200 increases interactions with CFC species. This increased interaction provides Freon compound analysis without sub-ambient cooling. Figure 1 shows the GC/MS analysis of five common Freons. All Freons are well resolved in less than eighteen minutes at 35°C.

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Rtx-200 as a Confirmational Column for EPA Methods

Confirmatory analyses are often required in many EPA methods. By running samples on a second, different polarity column, a more positive confirmation of component identity is achieved. Since many labs may be using several different EPA methods, it is highly desirable to use the same confirmational column for as many methods as possible. This reduces the time needed to change columns and the costs associated with purchasing several different columns. The Rtx-200 is an ideal confirmational column since it can be used for several different EPA methods and because it exhibits thermal stability to 360°C.

EPA Method 604 (Phenols)

Figure 2 shows the analysis of EPA Method 604 on both the Rtx-5 and Rtx-200 columns. The Rtx-200, when compared to the Rtx-5, produces a different elution order for seven of the eleven phenols. Both columns provide baseline resolution of all eleven phenols in less than thirty-three minutes. The high inertness of both columns results in excellent response for 9 phenols, even at a low concentration.

EPA Method 610 (PNAs)

The new Rtx-200 is an excellent confirmational column for the analysis of EPA Method 610. Figure 3 shows the analysis of PNAs on both the XTI-5 and Rtx-200 columns. Peaks 2-3 (acenaphthylene and acenaphthene) and 14-15 (Indeno(1,2,3-cd)pyrene and dibenzo(a,h)anthracene) reverse orders on the Rtx-200 when compared to the XTI-5. Since the Rtx-200 exhibits high thermal stability, it can be run under the same conditions as the XTI-5, reducing the analysis time to under thirty-five minutes and allowing simultaneous confirmation.

Also, use the Rtx-200 as a confirmational column to the Rtx-5 for these EPA methods:

- 607 Nitrosamines
- 608 Chlorinated Pesticides
- 612 Chlorinated Hydrocarbons
- 615 Chlorophenoxy Herbicides

Figure 2 - Rtx-200 switches the elution order for seven out of eleven phenols.

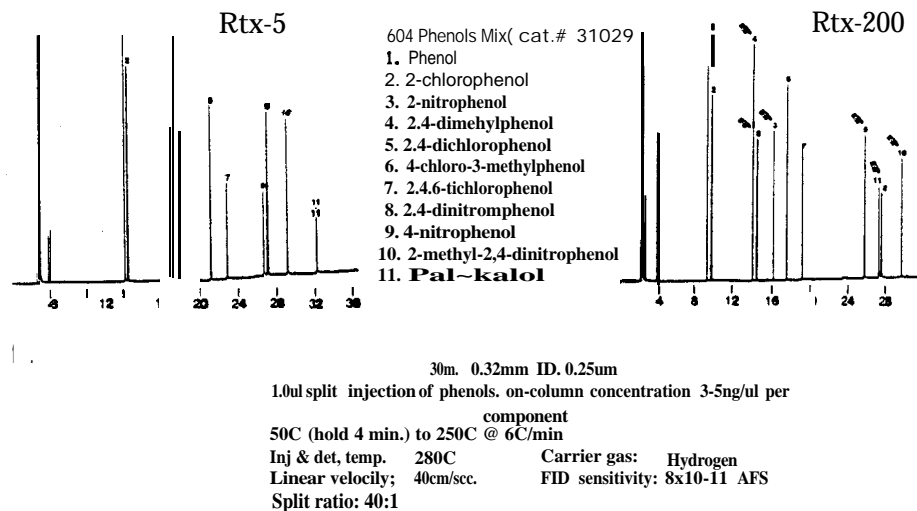


Figure 3 - Rtx-200 is an exceptional confirmation column for polynuclear aromatics.

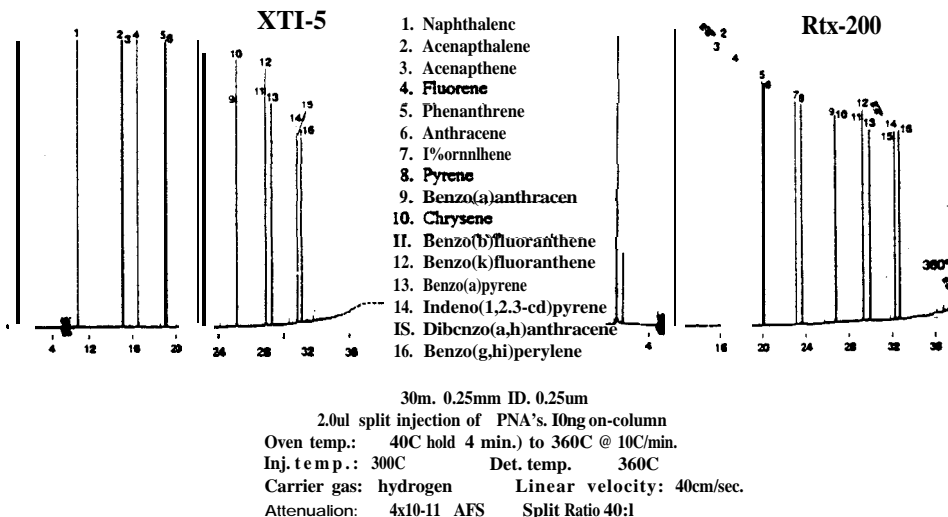
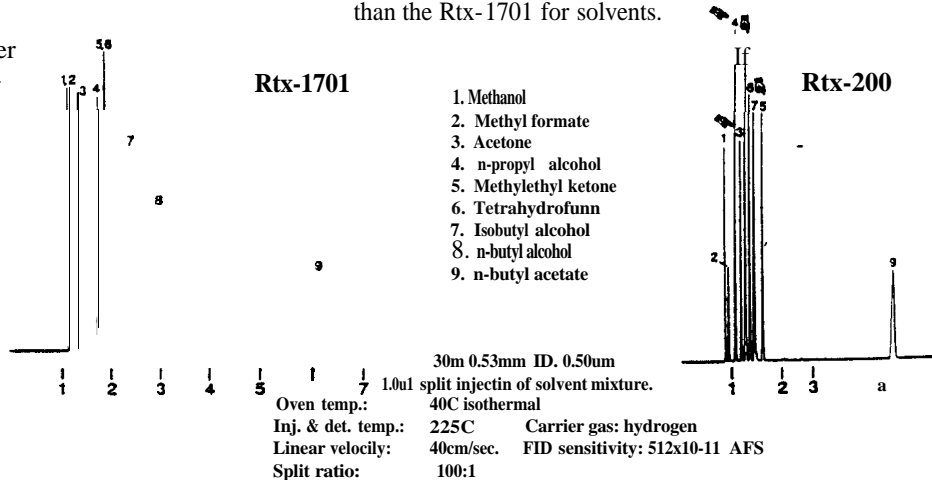


Figure 4 - Rtx-200 provides a faster analysis time and better resolution than the Rtx-1701 for solvents.



Solvent Analysis

The Rtx-200's special selectivity makes it ideal for solvent analysis. Figure 4 shows the analysis of polar solvents on the Rtx-200 and Rtx-1701. Both the solvent retention times and elution orders are considerably different on each column. The Rtx-200 exhibits a faster analysis time than the Rtx-1701, and provides baseline resolution of all the solvents.

Thermal Stability Extended by 100°C

The maximum operating temperature of the new Rtx-200 is 360°C. This is a 100°C increase over other commercially available trifluoropropyl phases. The fluorine groups on the Rtx-200 would normally produce a high background with an ECD. However, the crosslinking technology developed for this phase results in extremely low ECD bleed, even at high temperatures. The Rtx-200 is available in a variety of film thicknesses. Table 1 shows the film thicknesses and maximum operating temperatures of the Rtx-200.

Table 1 - Rtx-200's Film Thicknesses and Maximum Operating Temperatures

film thickness	useable operating temperature.*
0.10	360°C
0.25	360°C
0.50	330°C
1.0	325°C
1.5	310°C
3.0	270°C

Unique Polarity

Table 2 compares Rtx-200's Kovat's Retention Indices to those of other intermediately polar columns. The elevated retention indices of two probes, pentanone and l-nitropropane, indicate that the Rtx-200 exhibits unique selectivity for these compounds. Although the Rtx-200's

polarity is not as high as OV-210, it still exhibits strong dipole interaction and can be used in place of the OV-210 for many applications.

The Rf-200 is a highly selective stationary phase that is ideal for many types of analyses ranging from Freons to PNAs. Because of its unique polarity and high thermal stability, the Rtx-200 is an excellent confirmation column to the Rtx-5. The 330°C maximum operating temperature, low bleed, and excellent inertness gives analysts an alternative to other intermediate polarity capillary columns. Available in a wide range of lengths, film thicknesses, and diameters, the Rtx-200 column can solve many difficult analytical separations.

Table 2 - Retention Indices of the Rtx-1701, Rtx-50, Rtx-200, and OV-210

Phase	X	Y	Z	U	S	Aver.
Rt _x -1701	726	773	784	880	852	803
Rt _x -50	782	795	813	924	927	848
Rt _x -200	739	752	882	981	898	850
OV-210	799	828	985	1120	1009	948

X=benzene
Y=n-butanol
Z=pentanone
U=l-nitropropane
S=pyridine

Rtx-200 - the most versatile trifluoropropyl stationary phase!

length	df	0.25mm ID	0.32mm ID	0.53mm ID
15 meter	0.10	15005 \$250	15006 \$275	15007 \$290
	0.25	15020	15021 \$275	15022
	0.50	15035	15036 \$275	15037
	1.00	15050	15051 \$275	15052
	1.50		15066 \$275	15067
	3.00			15082
30 meter	0.10	15008	15009	15010
	0.25	15023 \$400	15024	15025
	0.50	15038 \$400	15039	15040
	1.00	15053 \$400	15054	15055
	1.50		15069	15070
	3.00			15085

length	df	0.25mm ID	0.32mm ID	0.53mm ID
60 meter	0.10	15011 \$650	15012	15013
	0.25	15026 \$650	15027	15028
	0.50	15041 \$650	15042	15043
	1.00	15056 \$650	15057	15058
	1.50		15072	15073
	3.00			15088
105 meter	0.10	15014 \$900	15015	
	0.25	15029 \$900	15030	
	0.50	15044 \$900	15045	
	1.00	15059 \$900	15060	
	1.50		15075	
	3.00			15091 \$1400

length	df	0.18mm ID	length	df	0.18mm ID	length	df	0.18mm ID
10 meter	0.20	45001 \$225	20 meter	0.20	45002 \$350	40 meter	0.20	45003 \$625
	0.40	45010 \$225		0.40	45011 \$350		0.40	45012 \$625

* The Rtx-200 polymer is stable to 360C, however, the useable upper temperature limit for thicker films has been decreased to temperatures that provide tolerable bleed for most detectors.