

# High Resolution GC/MS Separations of Dioxin or Furan Congeners

Using an Rtx®-Dioxin2 Column

by Gary Stidsen, GC Columns Marketing Manager



- Resolves all 2,3,7,8-substituted dioxins from each other and from non-toxic congeners.
- Resolves furan congeners from chlorodiphenyl ethers.
- Eliminates need for a second column.
- Low bleed stationary phase, stable to 320°C.

An analysis for dioxins or furans typically includes extensive sample extract cleanup, followed by high-resolution mass spectrometry, and a primary requirement of the analytical column is complete separation of the toxic dioxin or furan congeners (substitutions in the 2, 3, 7, and 8 positions). Unfortunately, separation of the toxic congeners from the non-toxic congeners proves difficult on almost all stationary phases.

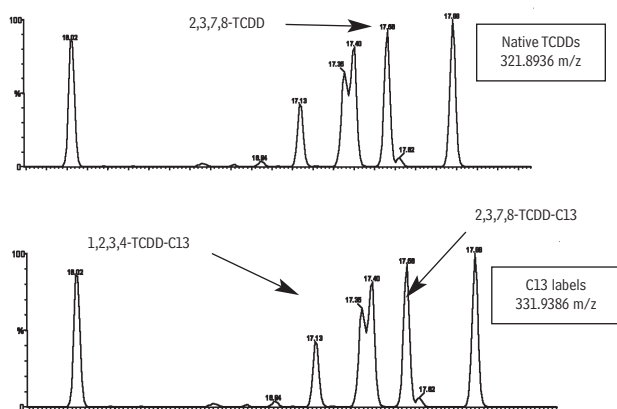
Quantification for some target congeners is inaccurately high, due to coelution with non-toxic congeners. The coelution issue has resulted in the use of confirmation columns, most commonly high cyanopropyl stationary phases, in order to more accurately quantify the toxic congeners. Unfortunately, cyanopropyl columns exhibit poor thermal stability, and therefore offer poor lifetime in this application.

With these problems in mind, Restek chemists developed the Rtx®-Dioxin2 capillary GC column. This column effectively resolves the 2,3,7,8-substituted congeners from each other and from non-toxic congeners. Figure 1 shows the separation of the tetrachlorodibenzodioxins on a 60-meter Rtx®-Dioxin2 column. 2,3,7,8-TCDD is well resolved from the other congeners in this group and can be quantified accurately.

Coelutions of toxic and non-toxic congeners also can make quantification of the hexachlorodibenzofurans difficult, but an Rtx®-Dioxin2 column resolves furan congeners as effectively as dioxins. Figure 2, a chromatogram for the HCDF congener group in reference material WMS-01, shows the congeners are very well resolved. Values for 1,2,3,4,7,8-hexachlorodibenzofuran, or for other congeners, compare favorably with values from the other columns typically used for this analysis.

We can provide elution orders for all of the commonly analyzed congeners, and chromatograms for each congener group in the WMS-01 reference material. If you would like this detailed information, or additional information about Rtx®-Dioxin2 columns, please contact us.

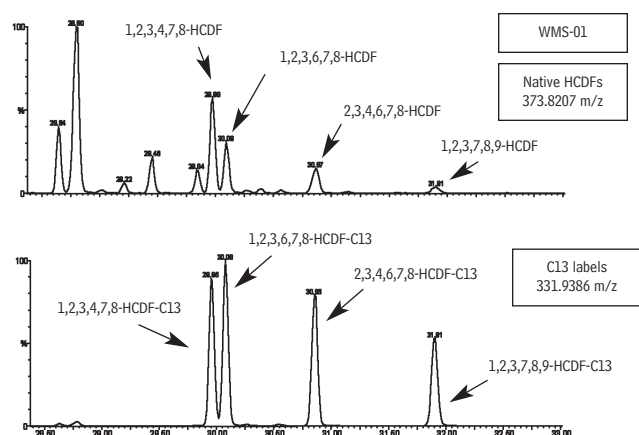
**Figure 1** 2,3,7,8-Tetrachlorodibenzodioxin resolved from other TCDD congeners, using an Rtx®-Dioxin2 column.



**Column and Conditions for Figures 1 and 2:**  
 Column: 60m, 0.25mm ID, 0.25µm Rtx®-Dioxin2 (cat.# 10758)  
 Oven temp.: 130°C (hold 1 min.) to 205°C @ 45°C/min. to 305°C @ 6°C/min. (hold 30 min.);  
 Dead time: 2.89 min.; Carrier gas: helium at 1.5mL/min., constant flow

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**Figure 2** Hexachlorodibenzofuran congeners resolved by an Rtx®-Dioxin2 column.



Chromatograms courtesy of Karen MacPherson and Eric Reiner, Ontario Ministry of the Environment, Etobicoke, Ontario, Canada.

WMS-01 and HCDF reference material courtesy of Wellington Laboratories, Guelph, Ontario, Canada.

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## Pittcon® presentation

This information will be presented by Dr. Frank Dorman, Oral Session 1000, Tuesday afternoon, March 1.

Plan to attend Dioxin 2005, and visit Restek!



### Rtx®-Dioxin2 Columns (fused silica)

ID	df (µm)	temp. limits	40-Meter	60-Meter
0.18mm	0.18	20°C to 320°C	10759	—
0.25mm	0.25	20°C to 320°C	—	10758