

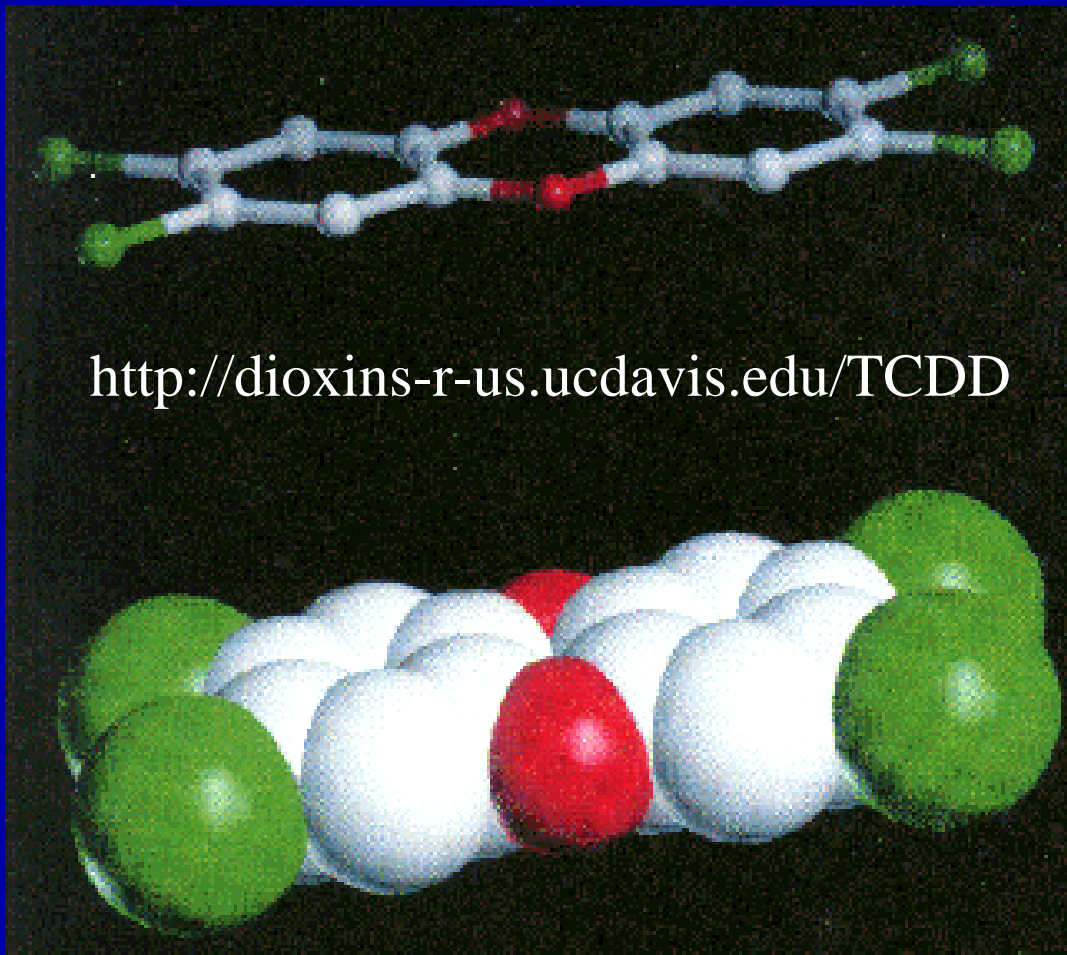
Introducing the Rtx-Dioxin Capillary Column

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www.restekcorp.com



Analysis of Dioxins and Furans



PCDD and PCDF Target List

# of Chlorine	#Dioxins	#Furans
tetra	22(1)	38(1)
penta	14(1)	28(2)
hexa	10(3)	16(4)
hepta	2(1)	4(2)
octa	1(1)	1(1)

() numbers are 2,3,7,8-substituted congeners

Dioxin and Furan Analysis

- Primary column commonly “5-type”
 - Significant number of coelutions of non-toxic congeners with 2,3,7,8-substituted congeners
- Confirmation column usually 225 or 2331
 - Poor thermal stability and lifetime
 - High baseline reduces sensitivity
 - Improved quantitation accuracy due to better resolution of toxic for non-toxic congeners

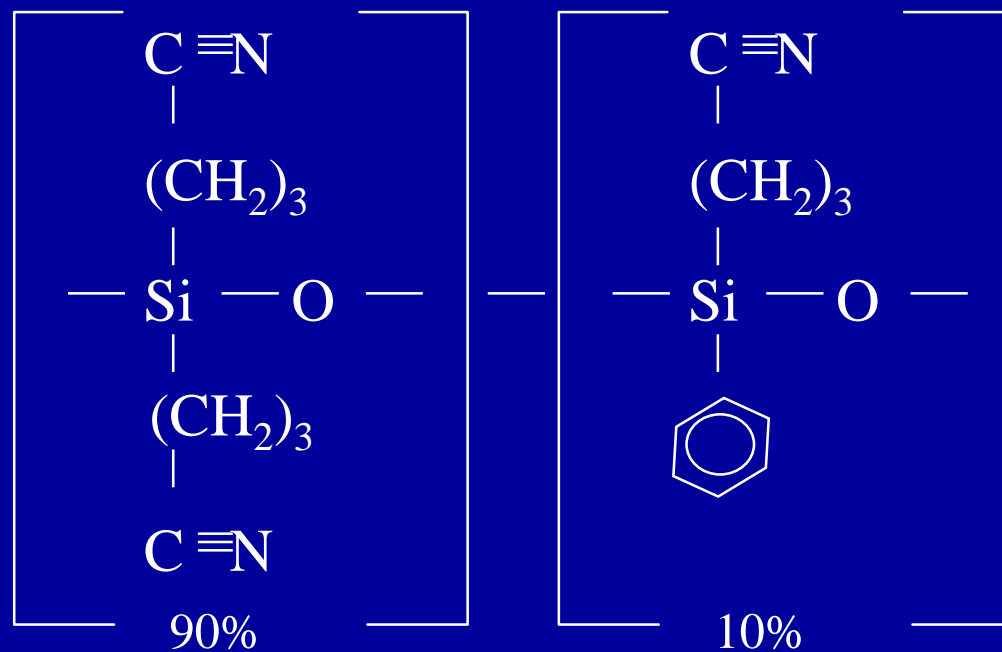
Desired Attributes of New Column/s

- To replace primary 5-type column
 - Improved separation of toxic congeners
 - Improved thermal stability?
 - Improved bleed levels?
 - Same or shorter run times
 - Fused silica column

Desired Attributes of New Column/s

- To replace 225 or 2331 confirmation column
 - Improved thermal stability
 - Improved lifetime
 - Compatible to primary column
 - Same oven for both columns
 - Less bleed
 - Improved sensitivity
 - Less reactive
 - Cyano-containing columns are prone to acid/base reactions

Rtx[®]-2330

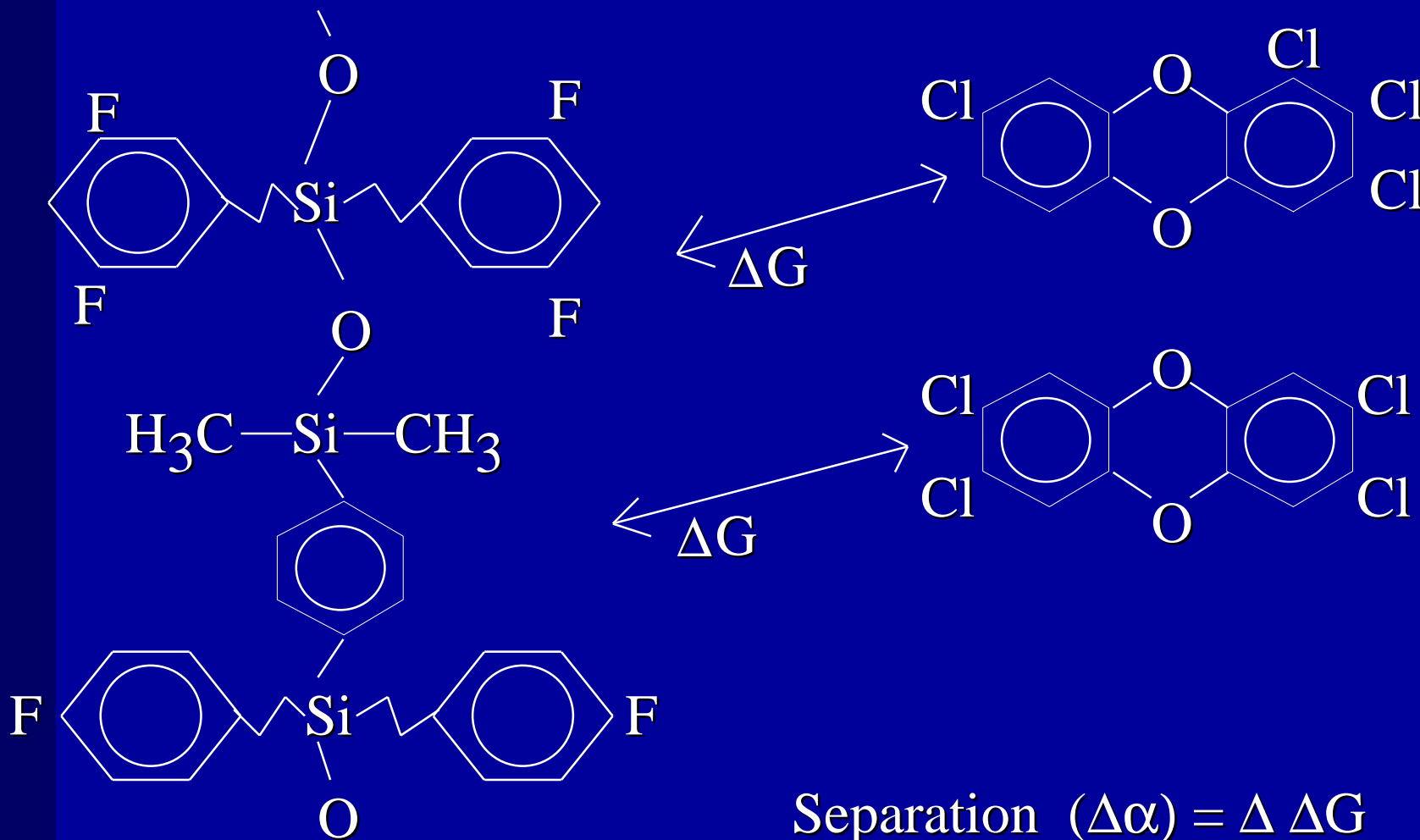


Polarity: very polar

Uses: cis/trans isomers

Properties: min. temp. (0°C), max. temp. (275°C)

Why Stationary Phase Selectivity Can Be Difficult....



Column Requirements

- Separate 2,3,7,8-substituted PCDDs/PCDFs from all other isomers
- High thermal stability (330°C +)
- High resolution GC-MS
 - 0.0001 mass resolution, PFK mass lock
- Reasonable run time (40-60 min.)
- Separate co-planar and mono-ortho PCBs
- Separation by chlorination level

Rtx-Dioxin Capillary Column

- Proprietary polysiloxane designed for replacement of “5”-type columns as primary, or high-cyano secondary columns for toxic dioxin and furan analysis by GC-HRMS
- 380 maximum operating temperature in standard high-temperature fused silica tubing

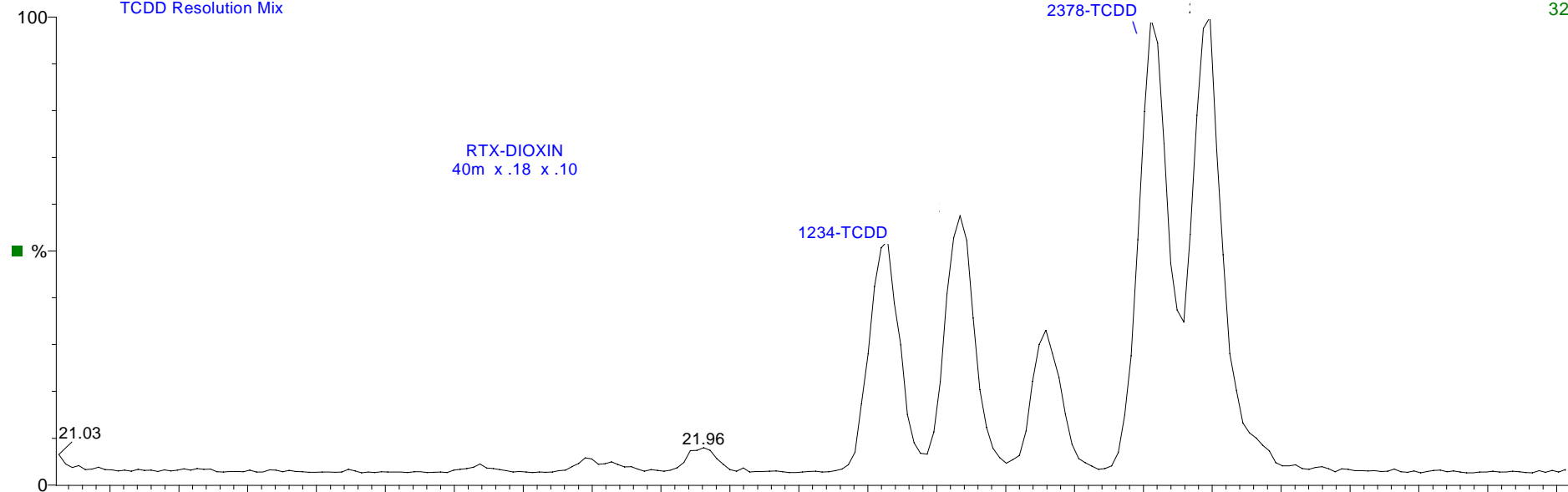
Dioxin and Furan Analysis

- Dual column method
 - Usually 5% diphenyl column and a high-cyano column (eg Rtx-225)
 - Cyano columns have poorer lifetimes and lower maximum operating temperatures
 - 5% diphenyl phases do not have the selectivity to accurately quantitate most samples
 - USEPA requires 2,3,7,8-tcdf to be confirmed on a X-225
- Desirable to have both columns in the same oven, and to improve the separation of the “5”

Feb06_0

TCDD Resolution Mix

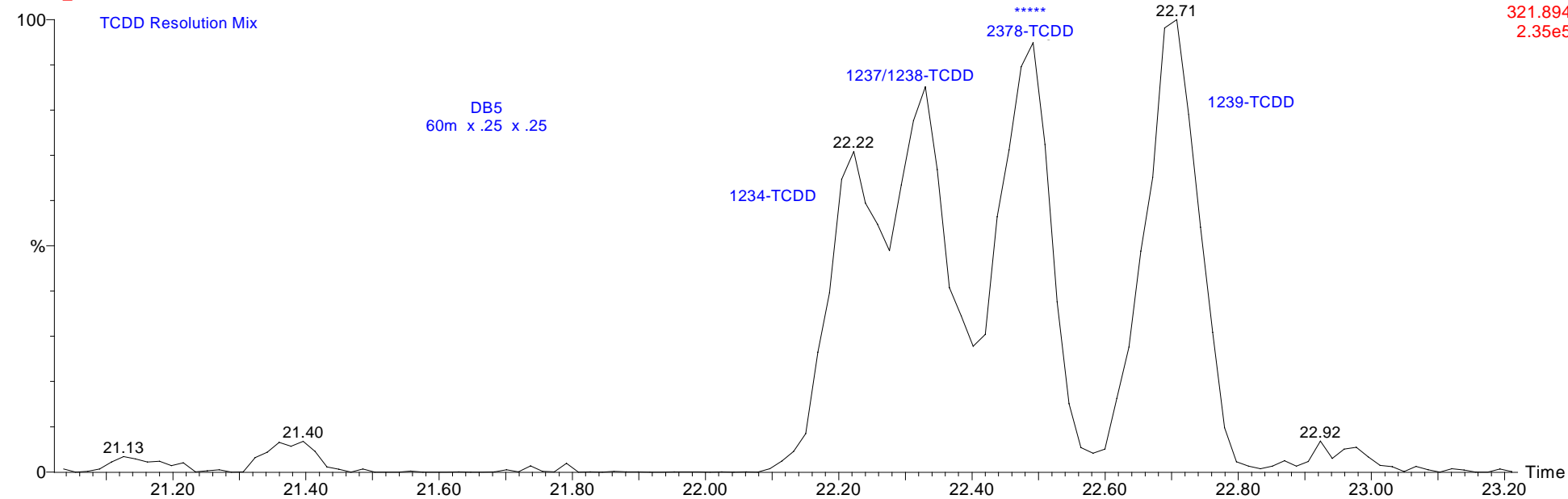
Voltage SIR 14 Channels EI+
321.8936
3.53e5



JUL26_QC-S003

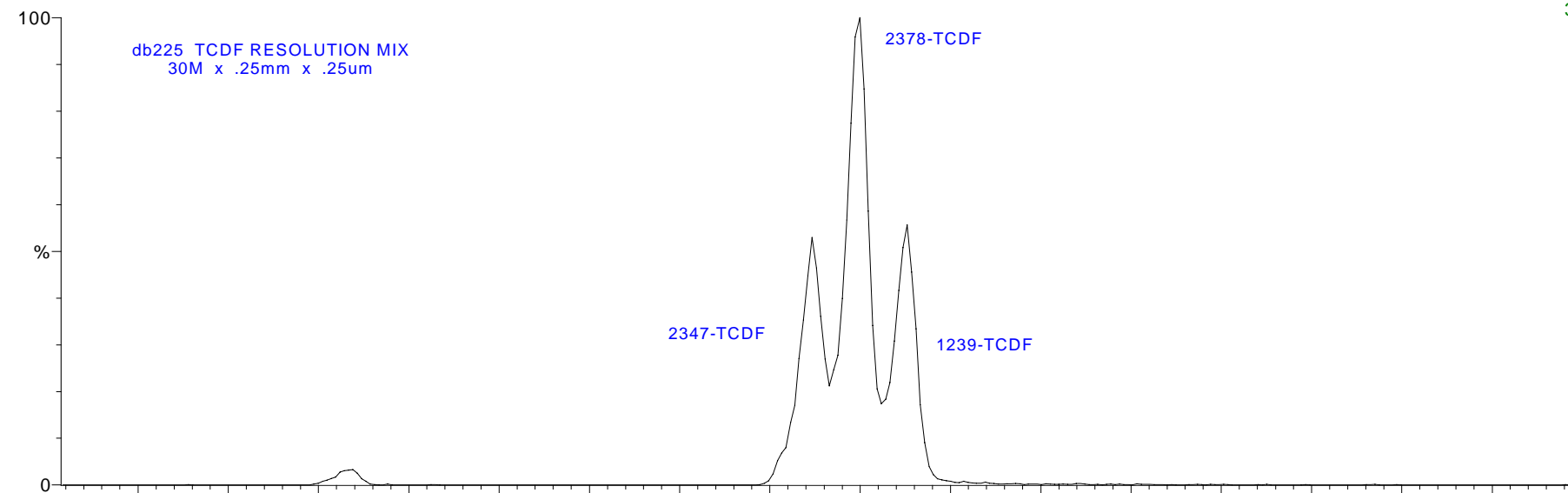
TCDD Resolution Mix

2: SIR of 20 Channels EI+
321.894
2.35e5



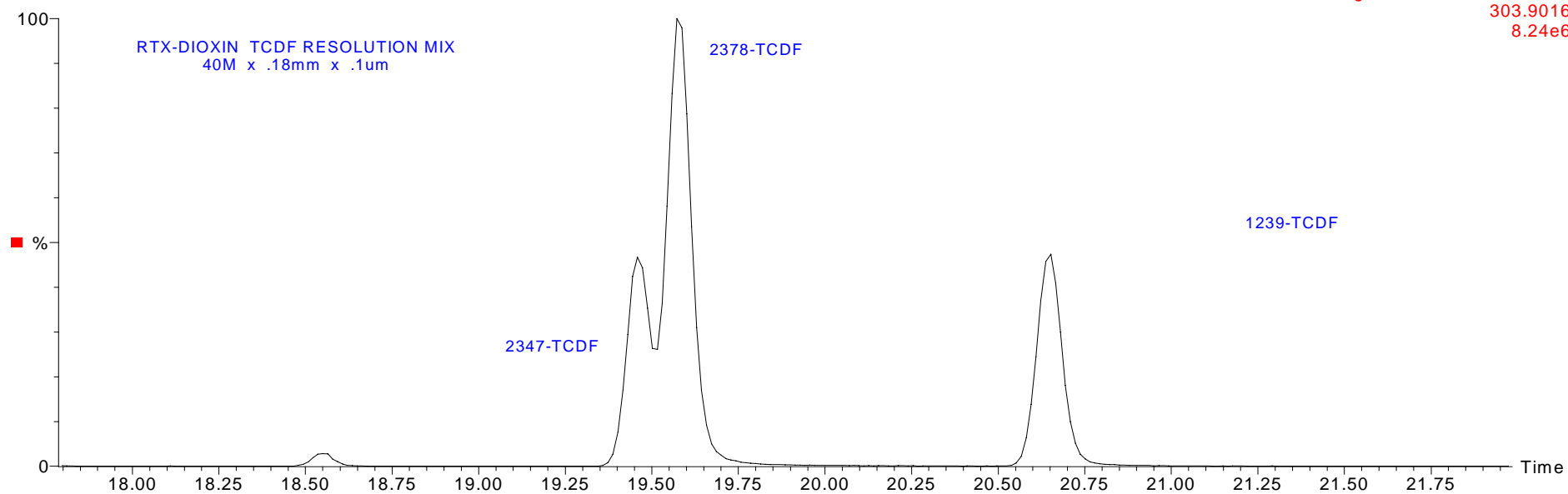
OCT24_QCS001

SIR of 12 Channels EI+
303.902
2.88e6



feb18_37

2: Voltage SIR 20 Channels EI+
303.9016
8.24e6



Fly Ash Round Robin Samples

>110 laboratories participating

	DB-5	DB-225	RTX-DIOXIN	MEDIAN	MEAN
Ash A	250	21	30	28	32
Ash B	2100	300	378	390	390
Ash C	170	19	28	27	32
All results reported as pg/g					

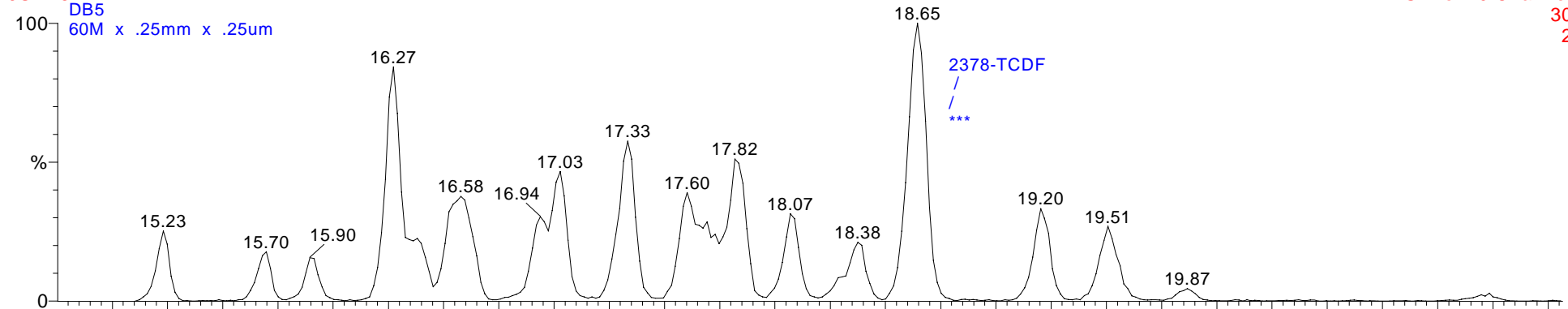
Median and Mean agreement gives good confidence in “true” value

Rtx-Dioxin Conditions

Micromass Altima High Resolution GC-MS			
Rtx-Dioxin 40m x .18 x .1			
Initial Temp 130 C			
	Time	Rate C/min	Temp
	0	52	200
	10.2	2.9	235
	10	6.9	300
	24		
Constant Pressure of 1.2 mL/min			
Injector Temp = 270C			

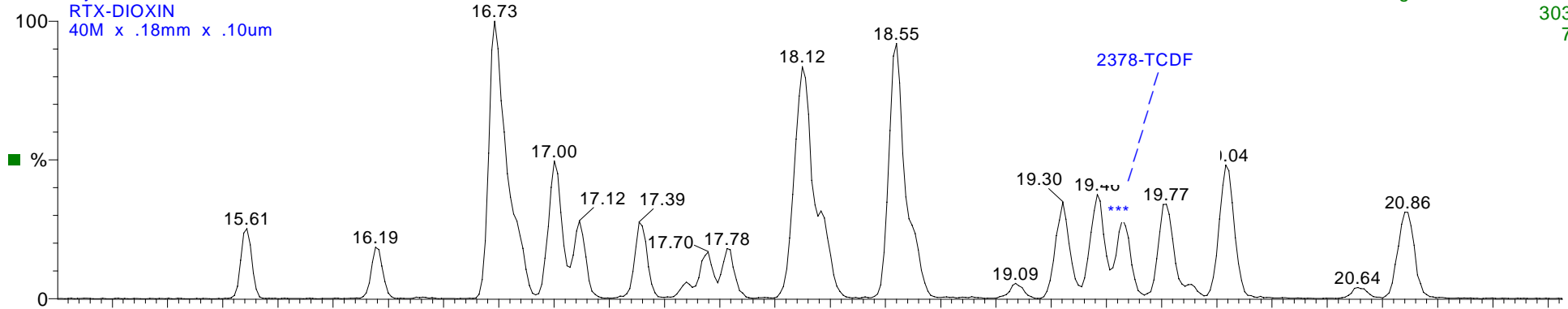
JUN18 Flyash extract
DB5
60M x .25mm x .25um

2: SIR of 20 Channels EI+
303.902
2.28e6



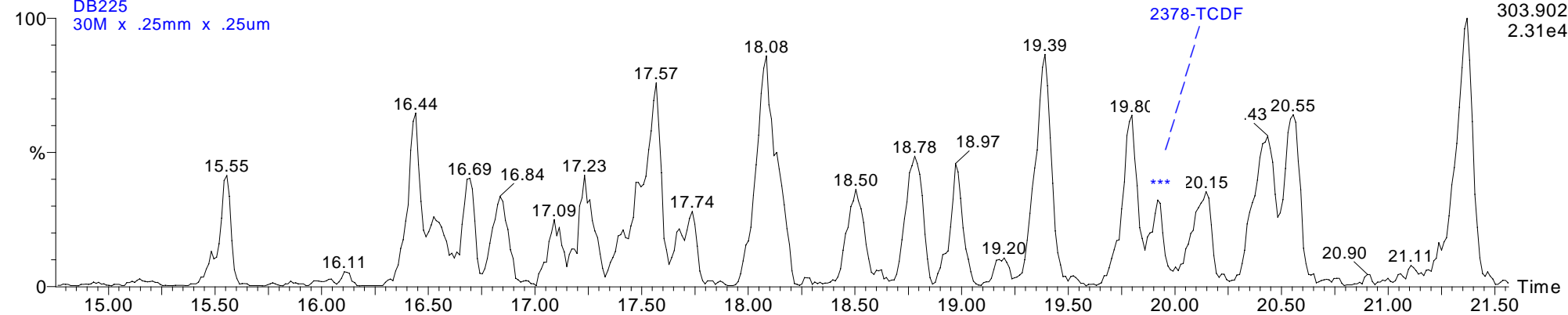
feb18 Flyash extract
RTX-DIOXIN
40M x .18mm x .10um

2: Voltage SIR 20 Channels EI+
303.9016
7.01e5

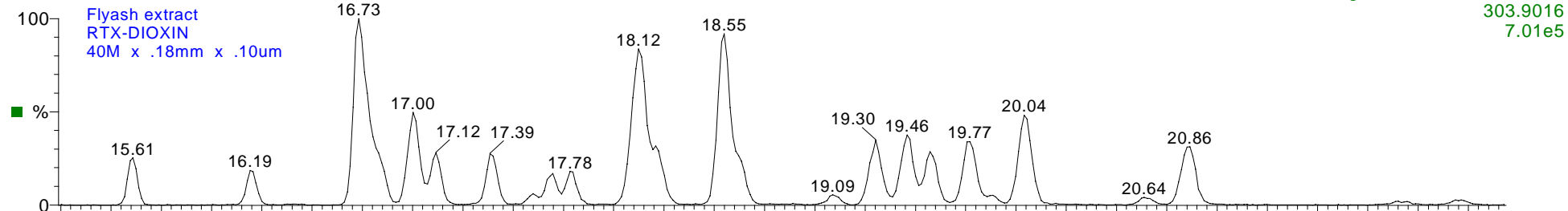


OCT24 Flyash extract
DB225
30M x .25mm x .25um

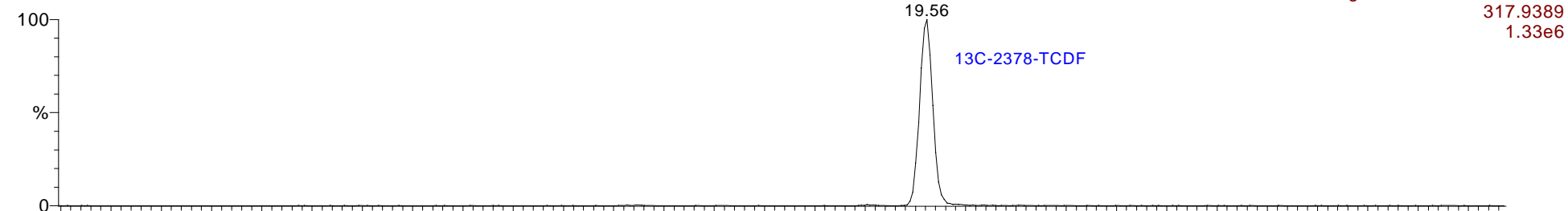
SIR of 12 Channels EI+
303.902
2.31e4



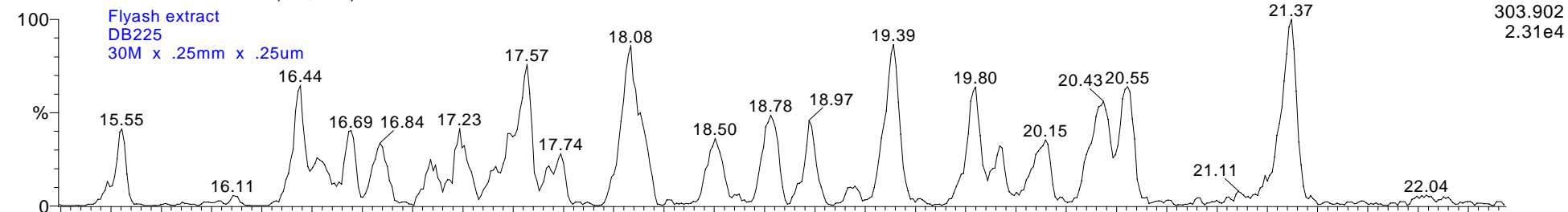
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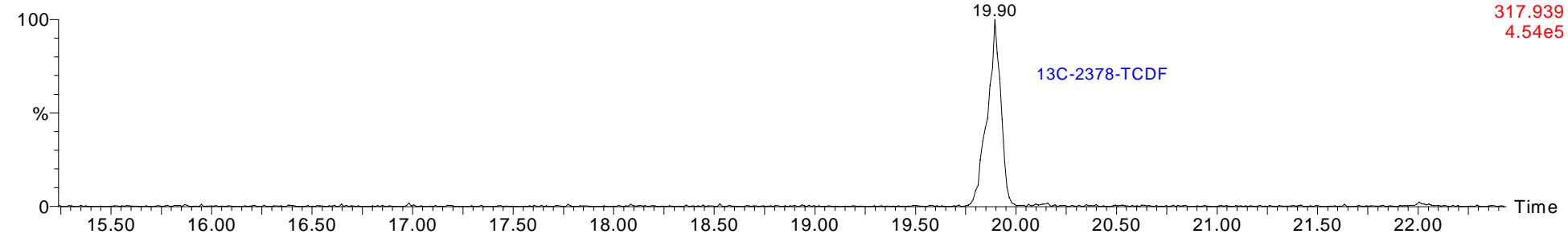
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OCT24_CONFIRM2S019 Sm (Mn, 1x1)



OCT24_CONFIRM2S019



Rtx-Dioxin Column

- Replaces a 5% diphenyl column for high-resolution dioxin and furan analyses
 - Improves sensitivity due to lower bleed levels
 - Improves separation of many congeners
 - May replace high-cyano columns as confirmation column to the 5% diphenyl
 - All but 2 congeners were within 10% of the fly ash median values
 - These 2 can be quantitated using the 5% diphenyl column
 - May eliminate the need for -2330, -2331, -225 confirmation columns
 - Final characterization currently underway complete for Dioxin
- 2003 August 24-29 in Boston

Acknowledgements

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