Internal Diameter (1D)

When selecting an internal diameter, sample concentration and instrumentation must be considered. If the concentration of the sample exceeds the column's capacity, then loss of resolution, poor reproducibility, and peak distortion will result. Table III shows typical column characteristics. Note the limited capacity of narrow bore columns (0. 18mm ID <50ng) versus the high capacity of 0.53mm ID columns (20OOng), Also, 0.53mm ID columns are recommended in high flow situations, such as with a purge-and-trap unit. Conversely, narrow bore columns can be installed directly into a mass spectrometry detector because of the limited flow at optimum linear velocity

Table III Film thickness directly effects phase ratio (P) which is an important consideration when changing internal diameter. When internal diameter increases, film thickness W) must increase in order to provide the similar resolution and retention. Table IV shows P values for common dimensions of columns. Similar values indicate similar elution for different IDs.

Table 111 *Typical Column Characteristics*

	Column ID			
	0.18mm	**0.25mm**	**0.32mm**	**0.53mm**
Helium (flow: 20cm/sec.)	0.3cc/min.	0.7cc/min.	1.2cc/min.	2.6cc/min.
Hydrogen (flow: 40cm/sec.)	0.6cc/min.	1.4cc/min.	2.4cc/min.	2.6cc/min.
Sample Capacity	<50ng	50–100ng	400–500ng	1000–2000ng
Trenzahl Values	40	30	25	15
Theoretical Plates/Meter	5300	3300	2700	1600
Effective Plates/Meter	3900	2500	2100	1200

Film Thickness

Film thickness has a direct effect on the retention and elution temperature for each sample compound. Thicker films retain compounds longer by maximizing the amount of time tile compounds spend in the stationary phase. Thinner films retain compounds less by minimizing, the amount of time the compounds spend in the stationary phase. Therefore, very volatile compounds should be analyzed on thick-film columns to increase the time the compounds spend in the column and allow them to separate. High molecular weight compounds, such as triglycerides, must be analyzed on a thin film column. This minimizes the amount of time the analytes stay in the column and provide low bleed at elevated temperatures, which are required when analyzing high molecular weight compounds.

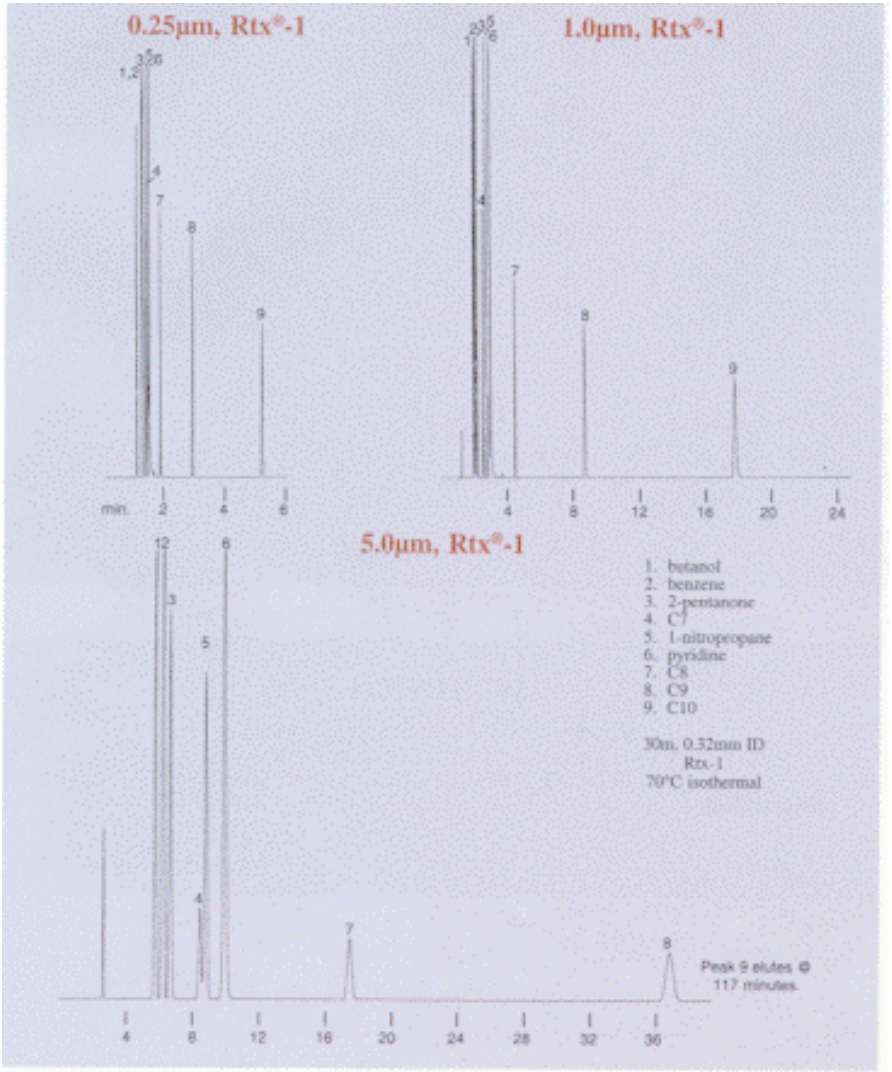
Film thickness directly effects phase ratio (beta) which is an important consideration where changing internal diameter. When internal diameter increases, film thickness (df) must increase in order to provide the similar resolution and retention. Table IV shows beta values for column dimensions of columns. Similar values indicate similar elution for different Ids

Table IV Common “beta’ values

Column ID	df	0.10µm	0.25µm	0.50µm	1.00µm	1.50µm	3.00µm	5.00µm
0.18mm		450	180	90	45	30	15	9
0.25mm		625	250	125	63	42	21	13
0.32mm		800	320	160	80	53	27	16
0.53mm		1325	530	265	128	88	43	27

The following chromatograms show a sample containing low boiling compounds analyzed on a 0.25. 1.0, and 5.0um film column, with all other variables held constant. Notice that the 0.25um column does not resolve butanol from benzene (peaks 1 & 2). The 1.0um column provides about 80% resolution of this pair. Note that the retention times of the compounds eluting on the 0.25um column more than double compared to the 1.0um column. Now, compare the 5.0um to the 0.25 and 1.0um columns. The resolution between butanol and benzene (peaks 1 & 2) is not any better than the 1.0um column, and the retention times have increased six times over the 0.25um. For this particular sample, the 1.0um column is best. The resolution is better on the 1.0um column than on the 0.25um column. and the 5.0um column does not offer any additional improvements over the 1.0um column. If our true interest was in resolving the compounds prior to butanol (peak 1), then the 5.0um column would be the preferred film thickness.

Film Thickness Effects
A sample containing low boiling components shows the differences in resolution between *0.25, 1.0, and 5.0um film columns. The 1.0um offers better resolution than the 0.25um, and the5.0um does not offer any further improvements over the1.0um. column for compounds eluting afterr C6.*



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