

MW Response Characteristics of RI & ELSD

Varian ELSD

Advantage Statement: Peak areas are very similar when comparing results from an RI detector and the Varian Evaporative Light Scattering Detector, but the ELSD delivers greater sensitivity.

GPC separations involve solutes covering a wide range of molecular size and it is important to understand the response characteristics of detectors used in GPC as a function of molecular weight. This was investigated using a series of narrow polydispersity polystyrene standards chromatographed using a modular system to which an RI detector was first connected, then subsequently replaced by the Varian ELSD (Table 1). Each polystyrene standard was prepared at nominally 1 mg/mL and a flushed full loop injection of 20 μ L was made. The actual peak areas recorded for the RI and the Varian ELSD were quite different. The Varian ELSD exhibited greater sensitivity but the relative peak areas for both detectors indicated very similar results; essentially, the response was independent of molecular weight over the range 1,000 – 1,000,000, as shown in Figure 1.

Columns: 2 x PLgel 5 μ m MIXED-C, 300 x 7.5 mm (pn: PL1110-6500)

Eluent: THF

Flow Rate: 1.0 mL/min

Detection: Varian ELSD (neb=40 °C, evap=90 °C, gas=1.0 SLM)

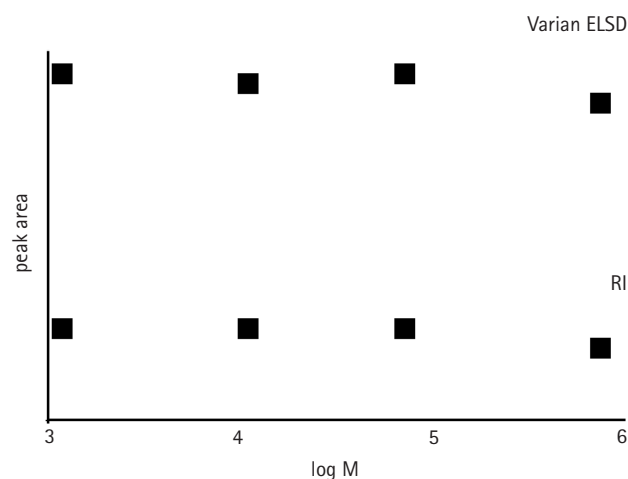


Figure 1. Molecular weight dependence of an RI detector and the Varian ELSD.

Performance at low molecular weights was investigated using a series of linear hydrocarbons as test solutes. The Varian ELSD has the potential to evaporate more volatile, lower molecular weight compounds and therefore smaller peaks are detected for the lower molecular weight probes, even when all are prepared at the same concentration (Figure 2a).

Table 1. Hydrocarbons and their characteristics.

Peak	Linear Hydrocarbon	MW	RI
4	C ₁₂ H ₂₆	170	1.4216
3	C ₁₆ H ₃₄	226	1.4340
2	C ₂₂ H ₄₆	310	
1	C ₃₂ H ₆₆	450	1.4550

Columns: 2 x PLgel 5 μ m 50Å, 300 x 7.5 mm (pn: PL1110-6515)

Eluent: THF

Flow Rate: 1.0 mL/min

Detection: Varian ELSD (neb=40 °C, evap=40 °C, gas= 1.0 SLM)

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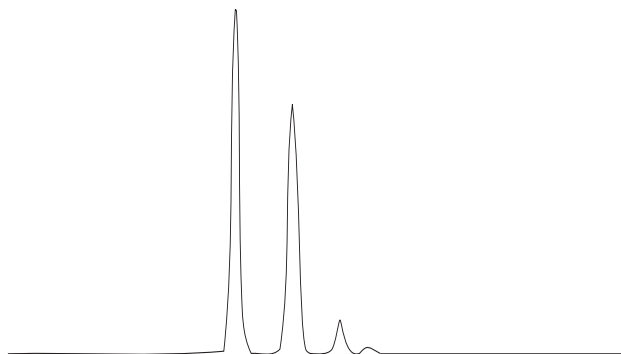


Figure 2a. Hydrocarbon peaks (1 to 4, left to right) revealed by the Varian ELSD.

The refractive index of lower molecular weight compounds in a homologous series tends to fall quickly below around 500–1000 molecular weight. Since the RI detector responds to both concentration and dn/dc , this results in smaller RI peaks for lower molecular weight probes even when all are prepared at the same concentration (Figure 2b).

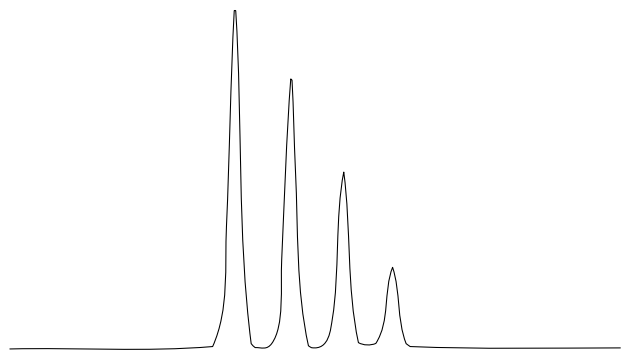


Figure 2b. Hydrocarbon peaks (1 to 4, left to right) using RI.

Therefore, response factors for low molecular weight compounds analyzed by GPC should be considered for both RI and Varian ELSD investigations.

These data represent typical results. For further information, contact your local Varian Sales office.



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