Altering Polymer Selectivity Using Temperature

Introduction

Using temperature as an active parameter in HPLC method development can provide several advantages for improving a separation. One of the more interesting features of elevated temperature HPLC are temperature induced selectivity changes. This Application note details temperature induced selectivity changes in polymer analysis and reducing analysis time by increasing the temperature.

Experimental

HPLC conditions are summarized in Table 1. A sample of Triton X-100 was analyzed at three different temperatures, 20°C, 50°C and 90°C.

Table 1:
Conditions for Analysis of Triton X-100 at Elevated Temperature

Column:	Agilent StableBond C18, 3.5 um, 150 x 3.0 mm
Mobile Phase:	50:50 Acetonitrile:Water
Flow Rate:	0.6 mL/min
Detection:	UV at 225 nm
Temperature:	20, 50, and 90°C

Results and Discussion

Figure 1 shows the separation of Triton X-100 at the three temperatures. At 20°C, the sample was well-separated and the elution order was from low molecular weight to higher molecular weight. At 50°C, most of the fractions co-eluted and were retained longer than at 20°C. At 90°C, the sample was well-separated once again, but now the elution order was from higher molecular weight to low molecular weight. Figure 2 illustrates the ability to increase flow rate to reduce analysis time by using high temperature. The viscosity of the mobile phase was lower at high temperature, which resulted in a lower back pressure at 90°C, so the flow rate was increased from 0.60 mL/min to 1.5 mL/min, reducing the analysis time from 50 minutes to 20 minutes.

Conclusions

Temperature was used to tune the selectivity of Triton X-100 and reverse the elution order of molecular weight fractions. In this example, the run time was reduced by over 50% using higher temperature because of a decrease in mobile phase viscosity and system back pressure that allowed a increase in flow rate, which resulted in an increase sample throughput.

References

Gerd Vanhoenacker, Pat Sandra, *J Chrom. A*, **1082** (2005) 193–202

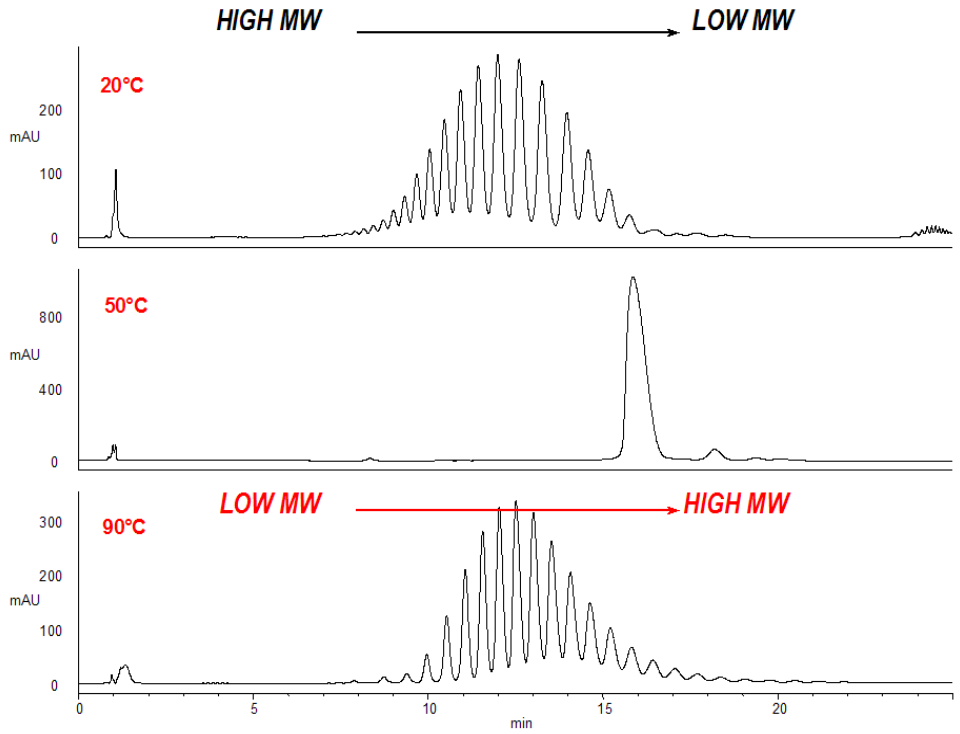

Figure 1: *Separation of the Triton X-100 at the three temperatures.*

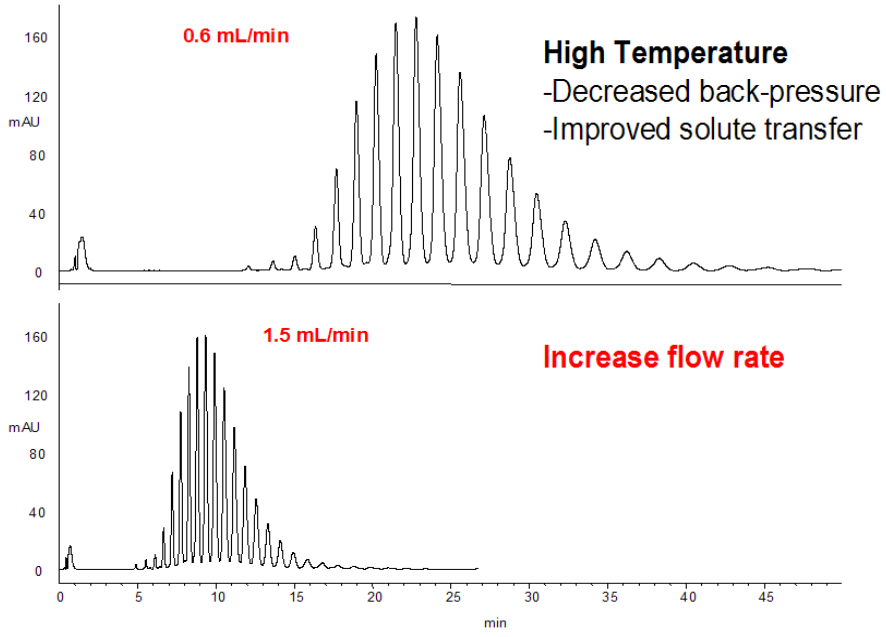

Figure 2: *Increasing speed of polymer separation by elevating temperature and increasing the flow rate.*