SEC for the Analysis of Non-ionic Surfactants

Application Note

Authors

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Introduction

Non-ionic surfactants are used in a variety of applications ranging from cleaning and personal care products to industrial processing. The hydrophobic and the hydrophilic portions of the surfactant molecule can be incrementally varied and manipulated to any molecular weight, in order to adjust its properties to suit a particular application. The determination of the surfactant molecular weight distribution is therefore extremely important in terms of performance as well as batch to batch reproducibility. This type of sample is normally relatively low in terms of molecular weight. Agilent PL aquagel-OH 30 8 µm columns are ideal for these analyses, because they combine low exclusion limit, high pore volume and high column efficiency (>35,000 plates/meter) for maximum resolution. Column calibration was achieved using polyethylene oxide Agilent EasiVial standards (Figure 1). EasiVials provide a rapid and convenient means of constructing an aqueous SEC column calibration curve over a wide molecular weight range (typically 100 to 1,200,000 g/mol). Each vial contains a mixture of four individual, highly characterized, narrow dispersity standards. The amount of each individual standard is carefully controlled during manufacture, allowing their use in SEC-viscometry, which requires accurate concentrations.

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Conditions

Non-ionic surfactants contain hydrophobic species so the addition of 30% of a weak organic solvent (methanol) is required to inhibit hydrophobic interactions between the sample and the column packing. The PL aquagel-OH packing material allows such eluent modifications while retaining the high column efficiency.

Samples: Surfactants; EasiVial PEO standards
Columns: 2 x PL aquagel-OH 30 8 µm,
           300 x 7.5 mm (p/n PL1120-6830)
Eluent: Water + 0.2 M NaNO$_3$ + 0.01 M
           NaH$_2$PO$_4$ at pH 7 + 30 % methanol
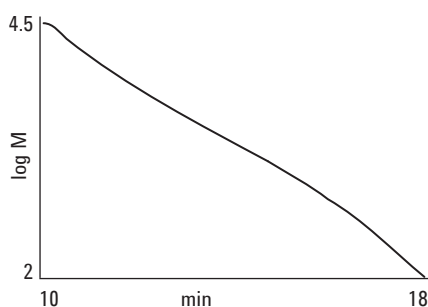Flow Rate: 1.0 mL/min
Detection: RI

Figure 1. EasiVial calibration of PL aquagel-OH columns

Results and Discussion

A typical raw data chromatogram for the sample is illustrated in Figure 2. The sample displays a low molecular weight shoulder.
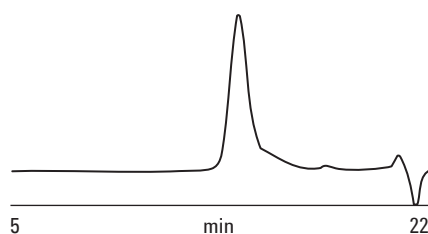

Figure 2. Chromatogram of a non-ionic surfactant

Conclusion

The presence of significant hydrophobicity in a surfactant is no barrier to its resolution by SEC with PL aquagel-OH columns. The column's ability to handle eluents containing up to 50% methanol means that such compounds can be resolved without interactions.

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