Hamilton PRP™-C18 High-Efficiency Separations at Any pH

The Hamilton PRP-C18 is a polymeric HPLC column designed to provide high-efficiency, reversed-phase separations over an extended column life in nearly any mobile phase or pH. The rigid stationary phase has excellent mechanical and thermal stability (> 100 °C), does not experience shrinkage or swelling, and is completely inert to most conditions commonly encountered in reversed-phase chromatography. In this study, the pH stability of the PRP-C18 is evaluated. Even after prolonged exposure to concentrated (1 molar) NaOH and H_2SO_4 there was no measurable deterioration in performance.

Octadecyl silane (ODS) is the prevailing stationary phase in reversed-phase HPLC. Despite a well-celebrated, widespread use in chromatography, traditional ODS columns are not without limitations. Acidic conditions promote hydrolytic stripping of octadecyl functionalization, while alkaline conditions (pH > 7) attack the silica bed, both of which are principle sources for anomalous peak shape and shifting retention times that progressively worsen over the life of the column.

The PRP-C18 reversed-phase column has similar mechanical stability (up to 5000 psi) and separation efficiency to that of traditional ODS, but without many of the chemical restrictions. The PRP-C18 stationary phase does not experience stripping or dissolution under the most extreme conditions. This allows for an expanded mobile phase repertoire for use in methods development or aggressive regeneration procedures.

Conclusion

Mobile phase pH is a useful tool in methods development, particularly for separation of neutral forms of amines or other organic bases under alkaline conditions. Although a few more recent C18 columns boast stability in alkaline pH, column life is still considerably shorter than if used under more favorable conditions. On the other hand, the PRP-C18 has genuine pH and chemical stability. The stationary phase is devoid of free silanols, does not strip, bleed, or dissolve at any pH, and therefore can be expected to perform reliably and reproducibly throughout the extended life of the column, regardless of mobile phase conditions.

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Prolonged Exposure to Harsh Conditions

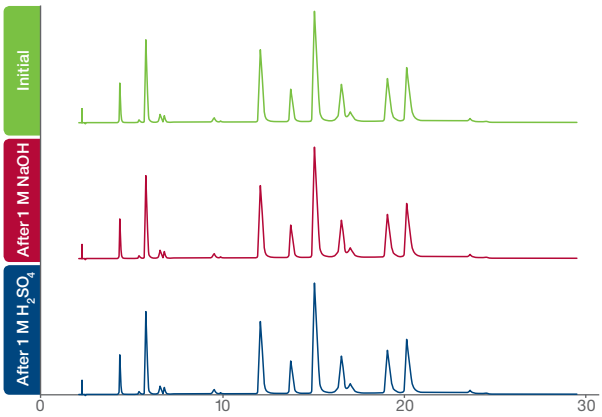

Figure 1: Separation of standard mix after 200 column volumes 1 M NaOH and 1 M H_2SO_4.

Experimental Conditions

Column: PRP-C18, 4.1 × 50 mm, 5 µm
Instrumentation: Agilent 1100 quaternary pump with UV detector
Standards: acetone, phenol, benzyl alcohol, benzene, toluene, ethylbenzene, propylbenzene, naphthalene, pentylbenzene, hexylbenzene

Mobile phase A: 0.2% Phosphoric acid
Mobile phase B: A + 95% ACN
Gradient: 5 to 100% B in 20 min
Flow rate: 2 mL/min
Temperature: Ambient
Injection volume: 2 µL
Detection: UV at 205 nm

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