Blaze$_{200}$ C18 Silica Column with Exceptional Temperature and pH Stability

Introduction

Although there are a variety of chromatographic supports such as polymeric and graphitic carbon materials that can be used at elevated temperatures, most HPLC chemists prefer the selectivity and higher efficiencies of silica-based columns. Increasing temperature can drastically limit the column lifetime when the bonded phase is based on traditional chemistries. Most silica-based HPLC columns can only be used to temperatures up to 60°C and a pH range of 3-8. Such columns have a propensity to degrade as water attacks the underlying support particles or the bonded phase.

Selerity's new Blaze$_{200}$™ column overcomes these obstacles. It consists of a new polydentate silane coating on silica particles that is stable at extreme temperatures, with added pH stability. The development of this new polycarbosilane bonding chemistry that is hydrolytically stable against breakdown in aqueous environments facilitates such analyses. It integrates multiple point attachments to the silica with a high degree of cross-linking. This combination creates a highly protective barrier over the silica backbone, protecting it from hydrolytic attack.

The column offers traditional C18 (ODS) selectivity, while providing enhanced temperature stability for use up to 200°C and pH conditions <1 to >12. Columns based on this chemistry are useful for both isothermal and programmed separations over wide ranges of temperature.

Dissolution of the Silica Support

Dissolution of the silica support is dependent on more than just bulk solubility in the fluid. Kinetics which are related to the flow across the surface and the surface area exposed, play a significant role, with the silica surface area for most columns greater than 150 m^2/gm. Because water becomes a more aggressive solvent at elevated temperatures, the concentration of water and its pH influence corrosivity. The higher the water content of the mobile phase and the higher the pH, the more vulnerable the silica is to breakdown. At low pH most bonded phases are detached and swept from the column. Increased temperature also increases the rate at which the silica backbone is dissolved.

Advanced Chemistry adds Stability and Durability

Dissolution of the silica particles increases with increasing temperature and pH. For durability under these extreme condition, the silica base layer must be shielded from hydrolytic attack. The Blaze$_{200}$ polydentate silica is a highly cross-linked bonded phase that provides protection of the underlying silica support.

Comparison Between Durable Chemistries

Several silica columns on the market have achieved increased stability at higher temperatures and pH, but the unique patent pending chemistry of the Blaze$_{200}$ makes it the most rugged column available. Here is a comparison of the Blaze$_{200}$ with other hybrid columns

- Waters
  * Each particle type must be optimized
  * Particle strength partially compromised
  * Surface organic groups reduce low pH stability
- Agilent
  * Sterically hindered phases give good stability with at elevated temperatures, but only at low pH.
- Selerity Blaze$_{200}$
  * Simple surface coating that works on any silica
  * Underlying particle structure undisturbed
  * Stability at low and high pH and high temperature

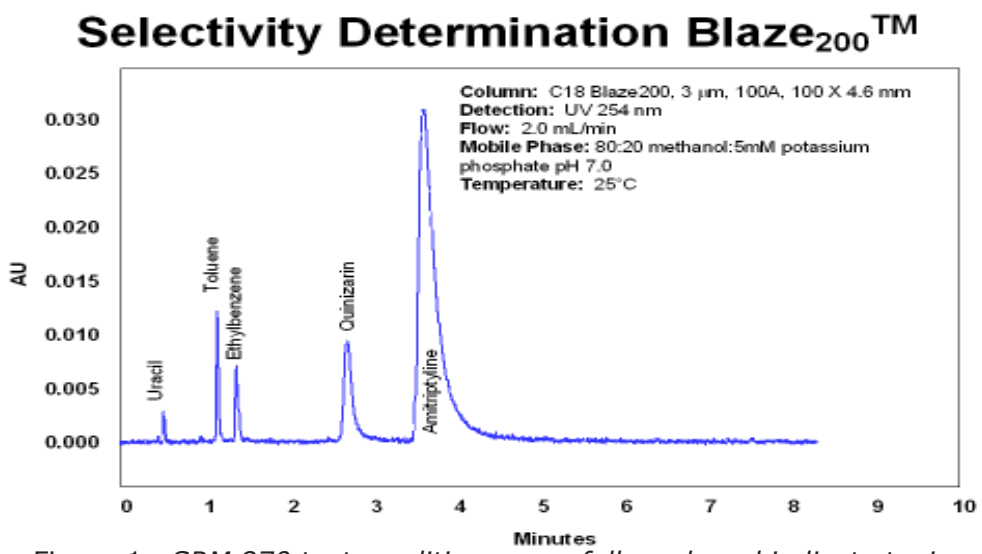

Figure 1. *SRM 870 test conditions were followed, and indicate typical C18 silica column selectivity. Tailing and asymmetry for amitripyline indicate some silanol interaction. Peak shape and elution of quinizarin indicate low activity toward metal chelating agents.*

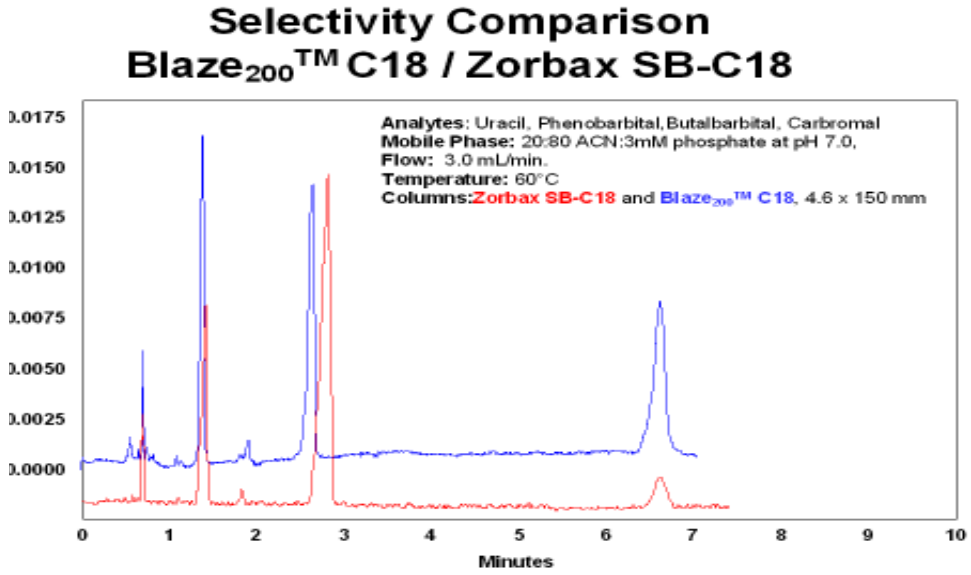

Figure 2. *Selectivity comparison of the Blaze$_{200}$ C18 column and the Zorbax StableBond C18 for a mixture of barbiturates.*

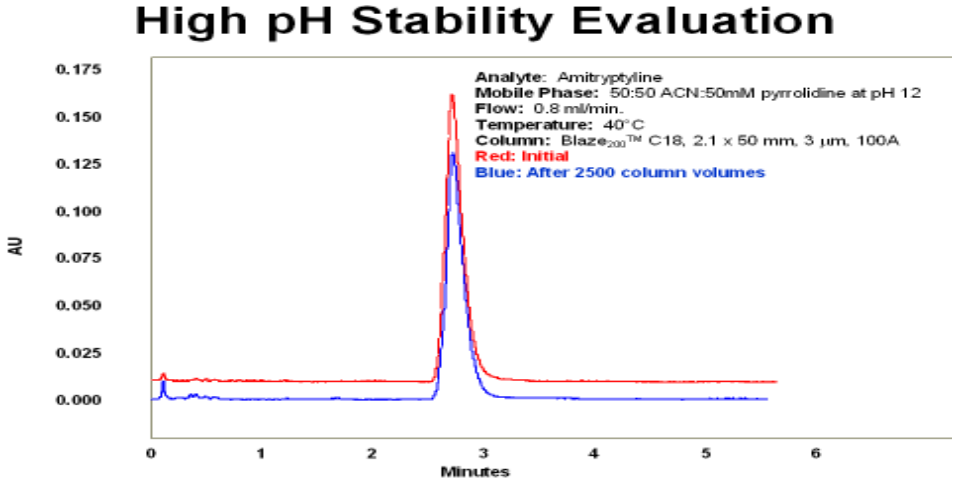

Figure 3. *Chromatogram showing amitriptyline peak with new Blaze$_{200}$ column and after flushing with 2500 column volumes of pH 12 mobile phase..*

Conclusions

A polydentate bonded phase for silica particles with unprecedented hydrolytic and thermal stability has been demonstrated. Reversed-phase operation with silica column selectivity can be performed at temperatures to at least 200°C and a pH range including 1-12.

Selerity Technologies has partnered with Restek to manufacture the Blaze$_{200}$ column.