RESTEK USLC™

Ultra Selective Liquid Chromatography™

USLC™ is the directed application of selectivity—the most influential factor affecting resolution—to optimize separations and improve method performance. Restek has extensively studied reversed phase selectivity to provide practicing chromatographers with the most effective and widest range of USLC™ stationary phase chemistries available.

Selectivity Drives Separations

By understanding and controlling selectivity through USLC™, chromatographers have the best opportunity for fast, effective analyte resolution.

One of the most significant challenges in method development is finding the proper stationary and mobile phase chemistry for a particular separation. As sample complexity increases, achieving adequate resolution between matrix components and target analytes becomes more difficult. Despite recent advancements in column format, such as sub-2 micron packings and pellicular particles, resolution can still be difficult to obtain because, while these formats can increase chromatographic efficiency and analysis speed, they do not significantly influence resolution. Selectivity, as shown in Equation 1, is the single most powerful factor affecting resolution, and it is largely dependent upon stationary phase composition.

Real Diversity in Phase Chemistry

Restek columns offer the widest range of selectivities available on a single column line. More choices mean optimized separations and more robust methods.

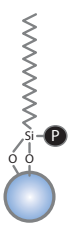
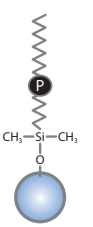
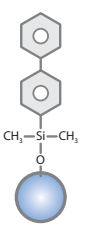
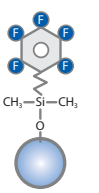
Equation 1 Selectivity drives resolution—USLC™ considers column selectivity during method development, resulting in fast, effective separations.

$$R = \frac{1}{4}\sqrt{N} \times \left(\frac{k'}{k'+1}\right) \times \left(\frac{\alpha-1}{\alpha}\right)$$

Efficiency *Retention capacity* *Selectivity*

While numerous bonded phases are available for reversed phase chromatography, many are similar and offer only moderate changes in retention (e.g. C8 and C18), rather than significant differences in selectivity. Method development is less laborious and time-consuming when using a full range of column selectivities, including orthogonal phase chemistries like polar embedded, phenyl, and fluorophenyl columns. Restek has led the development of unique USLC™ phases across these phase classes in order to provide chromatographers with a more effective range of column selectivities and innovative column chemistries for method development. The phases shown in Figure 1 provide the widest range of reversed phase selectivity available on any column line, and can be used to guide the least understood and most practically significant part of method development—proper column selection.

Figure 1 Restek offers the widest range of unique column chemistries to aid in fast, easy method development.

Restek phase (column class)	**Aqueous C18** (alkyl)	**IBD** (polar embedded)	**Biphenyl** (phenyl)	**PFP Propyl** (fluorophenyl)
				
Ligand type	Proprietary polar modified and functionally bonded C18	Proprietary polar functional embedded alkyl	Unique Biphenyl	Proprietary end-capped pentafluorophenyl propyl
Characteristics and uses	• C18 phase for balanced retention of multiple solute types. • Compatible with up to 100% aqueous mobile phases.	• Enhanced retention of polar acids. • Moderate retention of both acidic and basic solutes.	• Increased retention of aromatic, unsaturated, conjugated solutes, or solutes containing an electron withdrawing ring substituent. • Enhanced retention and selectivity when used with methanolic mobile phases.	• Increased retention of protonated bases and solutes containing aromatic moieties.