

## Introduction

Contained in this Applications Notebook are over 100 separations using XTerra® columns. With over 600 configurations, ranging from capillary to preparative, there is an XTerra® column for virtually any application.

For the first time, a hybrid stationary phase material brings together the high efficiency and mechanical strength of silica with the extended pH range of polymers. This extremely rugged material has high mechanical strength, high efficiency, excellent peak shape for bases, and easy scale-up from analytical to isolation and purification chromatography.

## Hybrid Particle Technology

Most reversed-phase separations take place on silica-based stationary phases. Attributes such as high efficiency and high mechanical strength have contributed to the success of silica-based stationary phases. However, silica-based stationary phases have also suffer from weaknesses such as poor peak shape for bases and a very limited operating pH range. Polymeric stationary phases have a much wider operating pH range but suffer from poor efficiency, weak mechanical strength and unpredictable peak elution order, thereby limiting their widespread acceptance. Hybrid Particle Technology\* combines the advantages of silica and polymers while eliminating both materials' disadvantages.

### Organic vs. Inorganic HPLC packings

	Advantages	Disadvantages
Inorganic (C <sub>18</sub> Silica)	Mechanically strong High efficiency Predictable retention	Limited pH range Tailing peaks for bases Chemically unstable
Organic (Polymer)	Wide pH range No ionic interactions Chemically stable	Mechanically 'soft' Low efficiency Unpredictable retention

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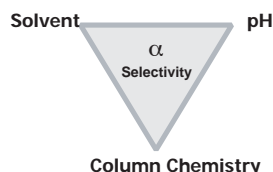
**Hybrid Particle Technology**

In Hybrid Particle Technology, one out of every three silanols is replaced with a methyl group during synthesis. These methylsiloxane groups are distributed homogeneously throughout the particle backbone resulting in a material that can be operated routinely from pH 1 to 12. In addition, these methylsiloxane bonds result in 33% less silanols (after endcapping and bonding), which provide improved peak shape for amine containing bases in any mobile phase at virtually any pH.

## Harness the Power of pH for Method Development

Tools available to the method development scientist for manipulating selectivity include mobile phase solvent, column chemistry and pH. For ionizable substances, the most powerful of these tools is pH. Acidic compounds have increased retention at pH values below their pK<sub>a</sub> and basic compounds retain longer at pH values above their pK<sub>a</sub>. Since many pharmaceutically active compounds are ionizable, a column with a wider usable pH range allows for greater retention time manipulation during method development.

### Selectivity Tools in Reversed-Phase HPLC

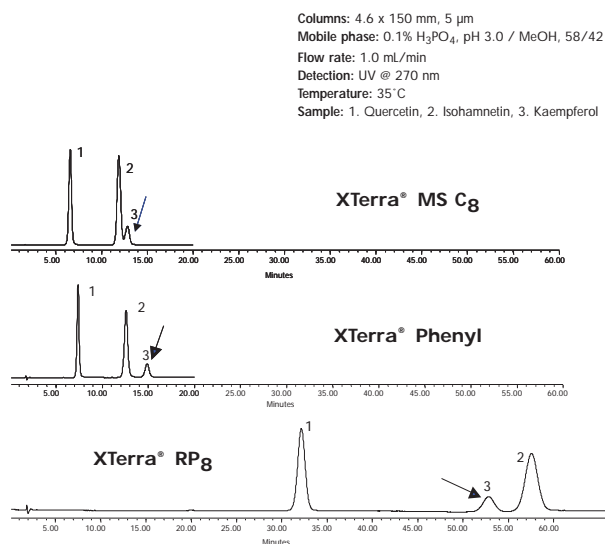


The pH range of XTerra® columns (pH 1 – 12) is twice as wide as silica-based columns (pH 2 – 8), thereby making method development twice as fast and twice as easy. For the first time, XTerra® columns allow the development scientist to fully utilize the power of pH as a method development tool. This ability to work at virtually any pH necessary for optimal selectivity provides other important advantages such as improved peak shape, increased retention and more robust separations.

## Complementary Column Chemistries

XTerra® columns' stationary phases come in five different chemistries, each with particle sizes appropriate for most applications. The complementary chemistries of these stationary phases, along with pH and mobile phase solvent are important parts of an overall method development plan.

### XTerra® Ligand Effect on Selectivity



### For More Information

To learn more about XTerra® columns and Hybrid Particle Technology, please visit us online at [www.waters.com/xterra](http://www.waters.com/xterra). (720000424EN)

