Selectivity of Core Shell Particles in HPLC

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INTRODUCTION

Core-Shell particles have become more and more popular in HPLC, finding great use in allowing speed to be increased, high resolution to be achieved and sensitivity to parellel that of UHPLC particles, but without the increased backpressure associated with UHPLC.

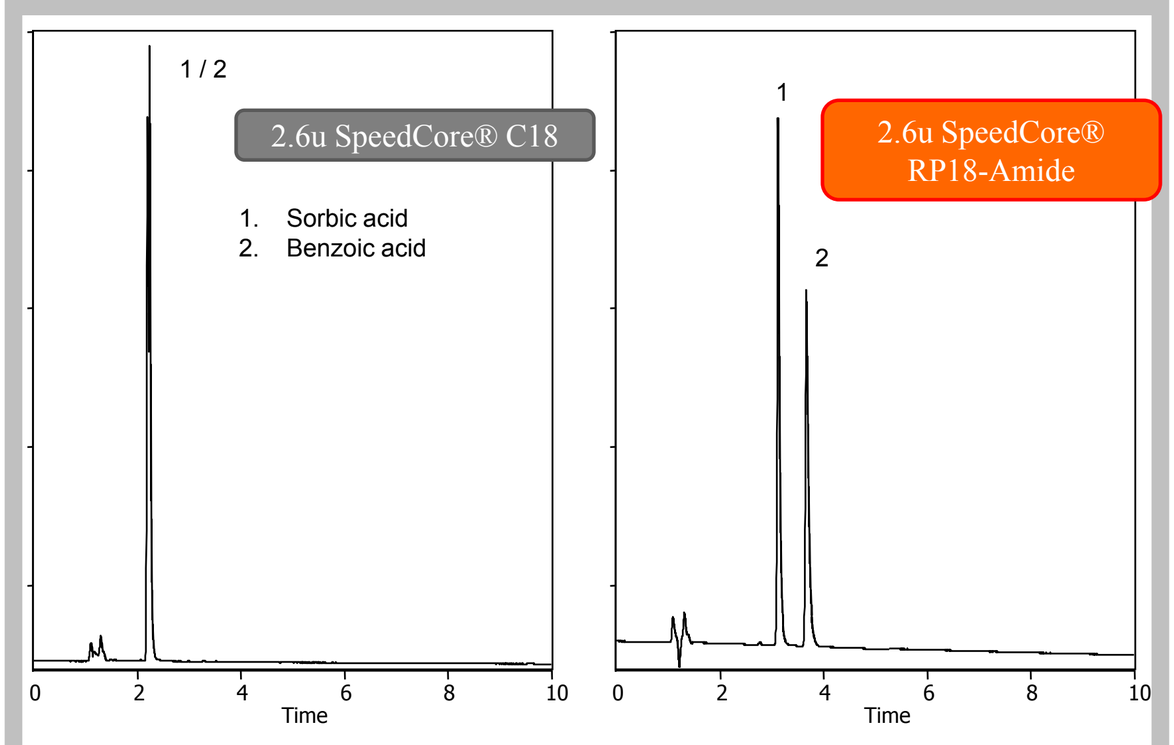
If you wish to run fast analysis then the use of particles with higher efficiency allows the resolution between peaks to be increased and therefore speed to be decreased significantly. However the use of efficiency alone is not the strongest term in the resolution equation and cannot be relied upon for more complex separations with critical pairs.

In this poster we discuss the use of a new core-shell polar embedded stationary phase. This new phase shows orthogonal selectivity to that of standard alkyl chain stationary phases.

Increased Resolution

Figure 1. shows how the resolution of Sorbic acid and Benzoic acid is not easily achieved on a C18 column even when we employ the very high efficiency of the core-shell particles. Moving to the orthogonal selectivity provided by the SpeedCore® RP18-Amide leads to resolution being achieved for the two acids whilst maintaining a rapid analyse time.

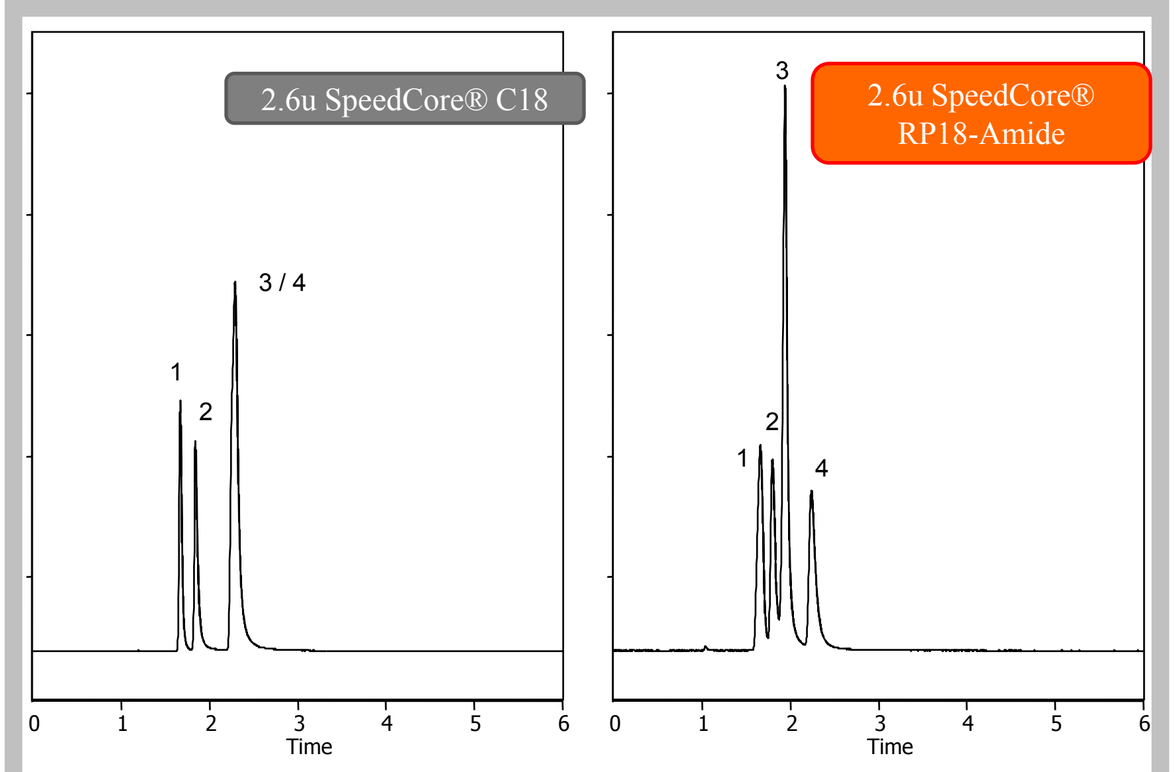
FIGURE 1. Separation of Acids



Both columns 150x4.6mm 2.6um
80:20 20mM Phosphate pH 2.4 : ACN Flow: 1ml/min Wavelength: 254nm

Figure 2. highlights the separation of a critical pair of analytes. Traditional C18 chemistry struggles to determine the difference between Nicotinic acid and Isonicotinic acid. The change to a RP18-Amide phases provides full resolution between all four compounds, easily distinguishing between the subtle changes in structure.

FIGURE 2. Orthogonal Selectivity – Nicotinic acids



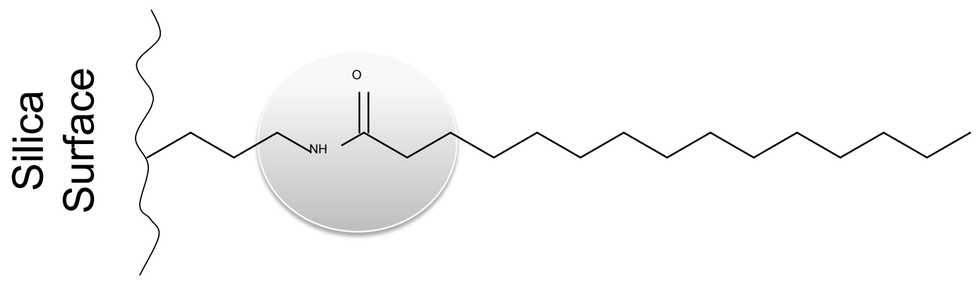
1. Isonicotinamide 2.Nicotinamide 3.Nicotinic acid 4. Isonicotinic acid

Both columns 150x4.6mm 2.6um
98:2 0.1% Formic acid : MeOH Flow: 1ml/min Wavelength: 254nm

Structure - Mechanism

The structure of the SpeedCore® RP18-Amide allows for differing mechanisms to that of a straight alkyl chain C18 stationary phase. Replacing part of the chain with an Amide functionality provides a polar embedded region with which analyte molecules can interact. The potential charge in the stationary phase can lead to strong acid retention and sharp peak shapes for basic components. Polar compounds capable of H-bonding will also achieve enhanced retention and resolution on this stationary phase, making it ideal for resolving phenol's, carboxylic acids, amines from each other as well as from neutral and non-polar analytes.

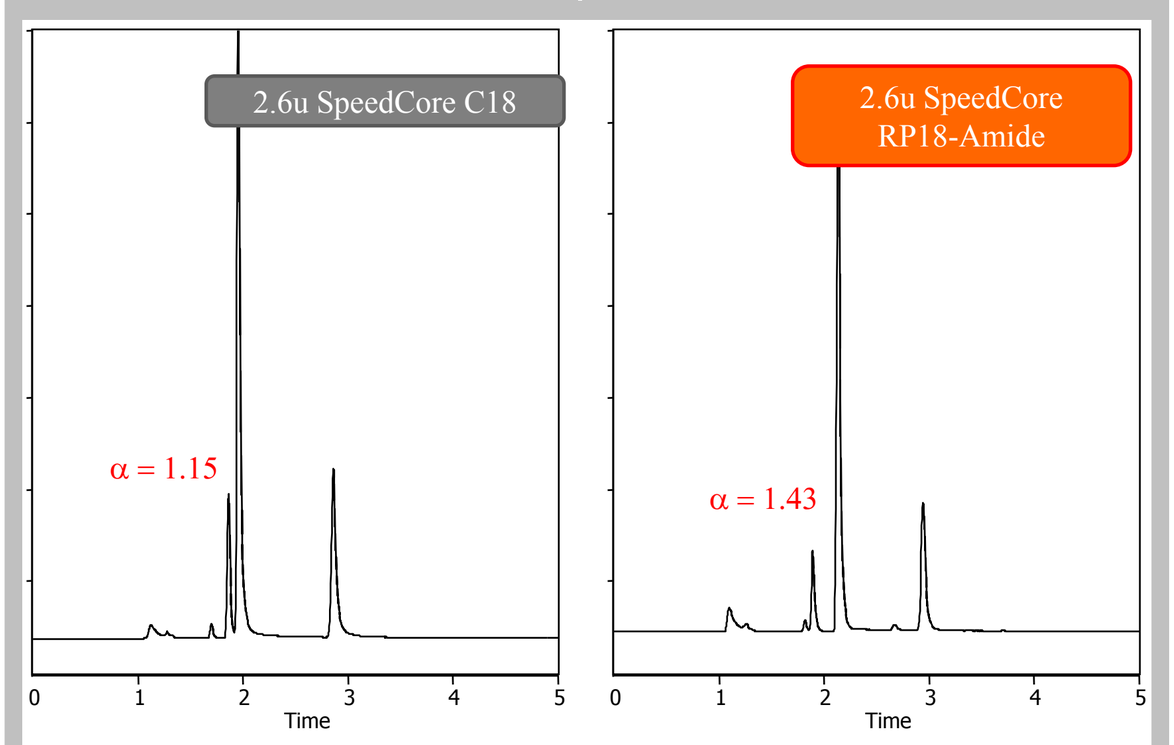
FIGURE 3. SpeedCore® RP18-Amide Structure



Accuracy of Data

Most developed methods will specify variables that need to be obtained in order to operate with a robust, reproducible and accurate method. This usually includes resolution between critical pairs. In figure 4 we see that an alpha(α) value that is only just over 1 means that you are struggling to achieve baseline separation , a value of 1 being no separation at all. The RP18-Amide in the chromatography below shows a much greater α value and is clearly now baseline resolved under the same mobile phase conditions.

FIGURE 4. Orthogonal Selectivity – Antibacterials



Both columns 150x4.6mm 2.6um
55:45 20mm Phosphate pH 2.4 : ACN Flow: 1ml/min Wavelength: 254nm

Conclusion

In this poster we have shown several separations that are achievable on a new commercial RP18-Amide stationary phase. Combining high efficiency core-shell particles with an orthogonal stationary phase chemistry expands the possibilities of achieving full baseline resolution between critical closely related molecular species.

We have used some examples to highlight the comparison with a traditional straight alkyl chain C18 phase, and shown how the RP18-Amide offers scope for achieving difficult separations that are not readily achieved on the C18 chemistry.

By having the ability to alter selectivity using the stationary phase the analyst can narrow the choice of mobile phase options in the method development process, keeping simplicity and therefore productivity as a key factor.