Comparison of New Core-Shell Technology

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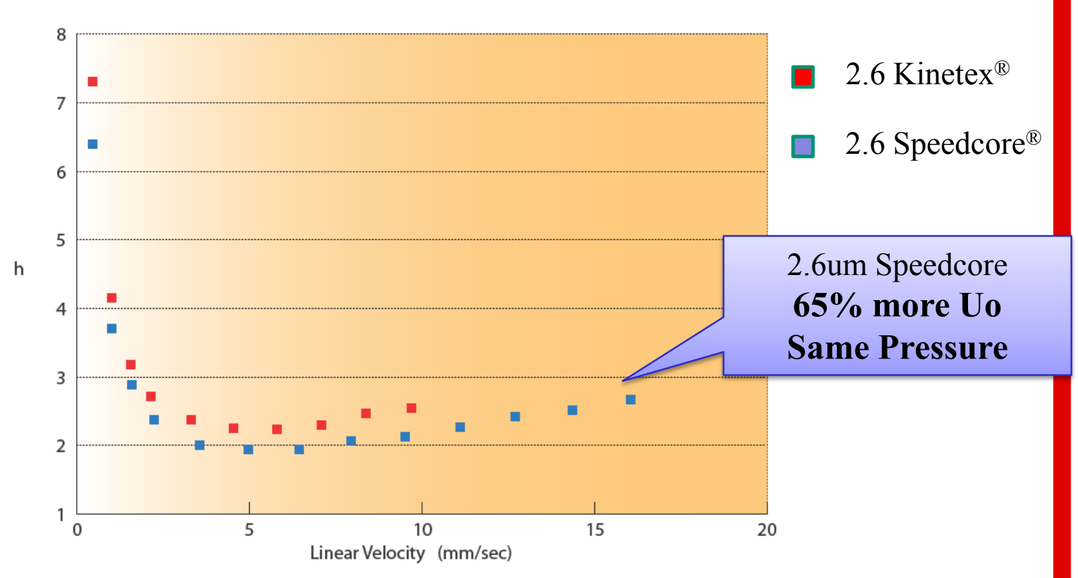
INTRODUCTION

In this poster we discuss the aspects of a new core-shell product that offers the analyst speed of analysis, increased sensitivity and lower backpressure than previously available.
We discuss how core-shell technology is improving the productivity of HPLC analysis whilst still utilising traditional HPLC systems.
There is still a lot to learn from a manufacturing point of view with core-shell technology and we highlight how one core-shell can be very different from another. Van deemter equations provide some of the answers but not all of the variables are covered, so we look at the comparisons possible.

How does this technology differ from the use of UHPLC and which one is the correct choice in any given situation? Given that both offer high speed, high sensitivity? We look at questions such as this and try to point out the benefits and weaknesses that each may possess.

FIGURE 1. Van Deemter Curve



Particle Characterization

Speedcore particles produce very low reduced plate counts in comparison with other core-shell phases. This means the analyst gets higher efficiency separations. Figure 2. shows how backpressure can vary highly between different particle sizes and different column manufacturing.

FIGURE 2. Backpressure

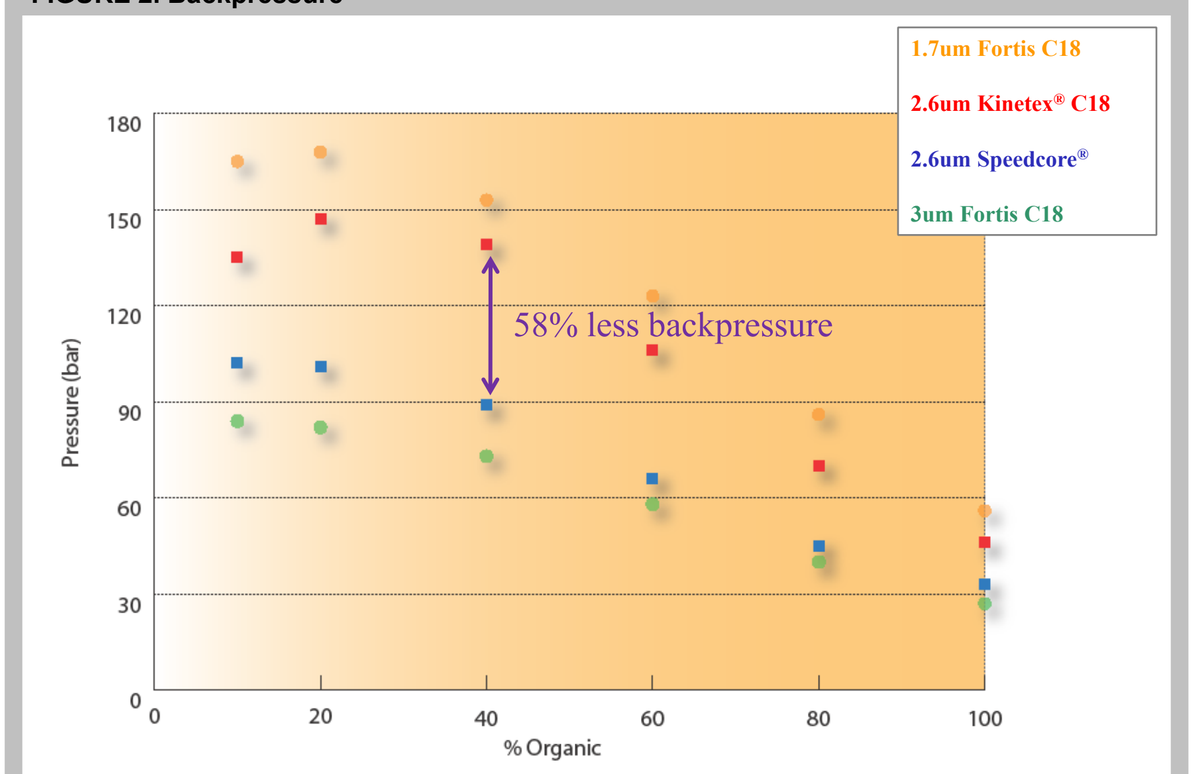


Figure 2. Highlights how nearly 60% difference in backpressure is noted between 2 core-shell particles both of 2.6µm particle size.

This difference in backpressure between 2 particles of nominal particle size will be due to the surface morphology of the particles, the pore structure, shell thickness and the packing processes used in the manufacture of the final column.

This difference will lead to the ability to run faster analysis utilising much higher flow rates without any loss in efficiency and resolution.

The capability to increase the flow rate well above normal means you can improve speed of analysis on traditional HPLC systems without the need for UHPLC equipment. Figure 3.

FIGURE 3. Improve Throughput

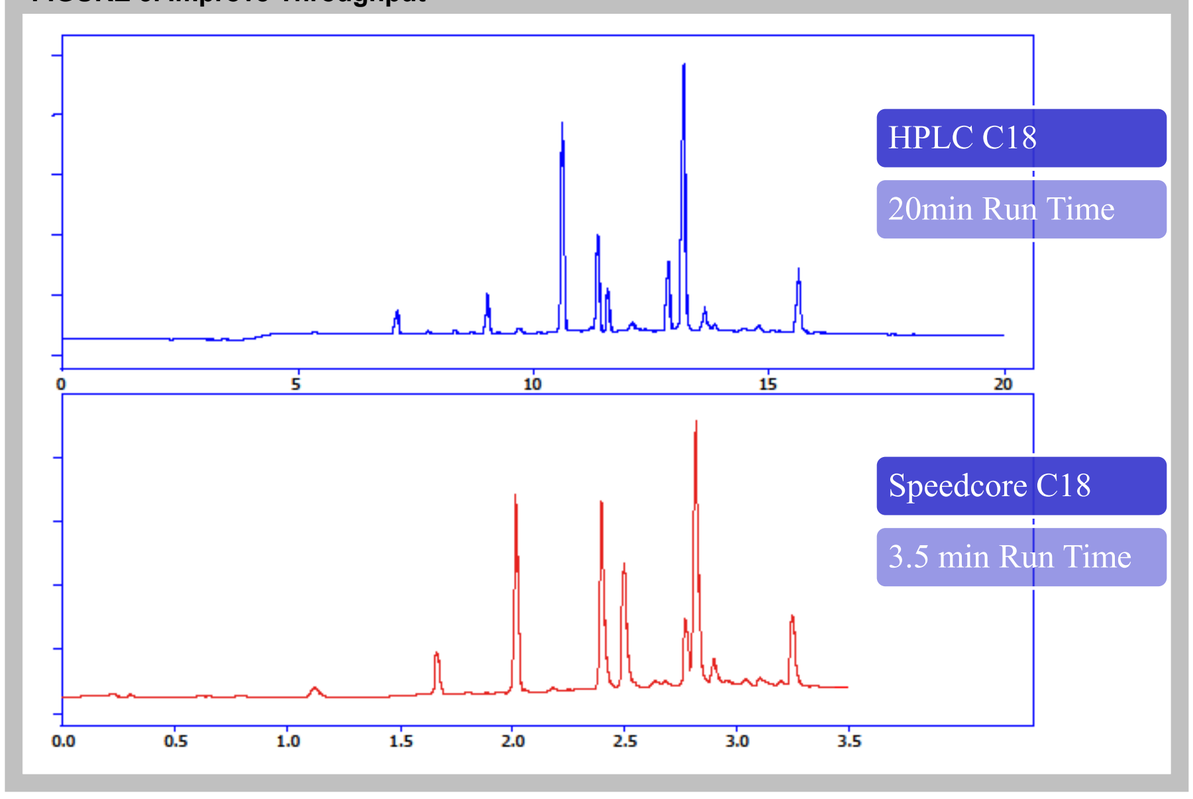


Figure 3. highlights how methods are now being transferred using this core-shell technology with a massive improvement in speed of analysis.
This will be especially useful in both method development screening (HTS) as well as adapting new procedures within a QC environment to significantly decrease overall production time.

One of the main advantages of these core-shell particles is the ability of the particles to operate on both 'traditional 400bar LC' and on the newer UHPLC systems. This allows the transfer of methods to be potentially simplified between various labs and organisational units, as well as outsourcing to CRO's. However one caveat on this is the necessity for well optimised systems, since dead-volume will rapidly decrease the available plate count and therefore compromise the expected efficiency gain.

FIGURE 4. Selectivity Differences

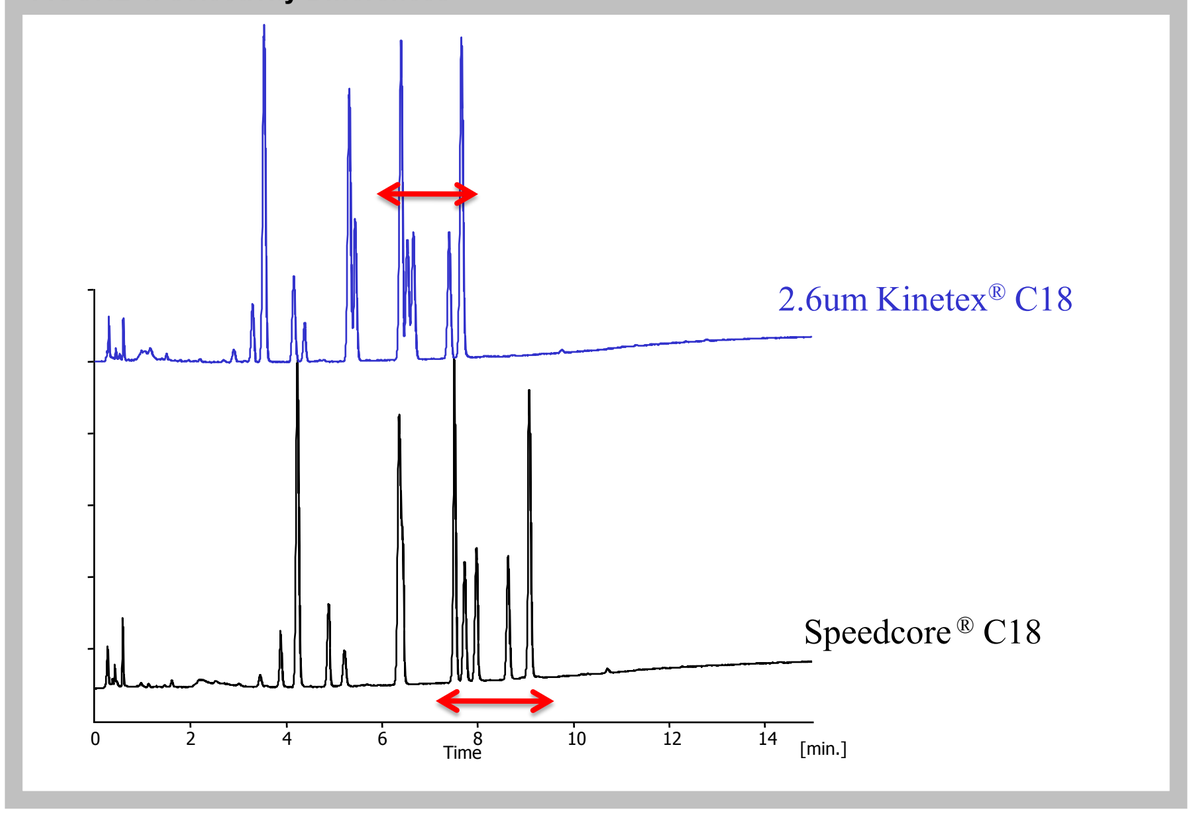


Figure 4. Highlights how selectivity will still be as important, if not even more so now that we have these core-shell particles. If you are planning on running a rapid analysis time, then resolution will be paramount since you only have a finite 'peaks per unit time' situation. Efficiency alone will not be enough to separate all compounds. This can be seen in our poster "Selectivity of Core-Shell Particles in HPLC"

Conclusion

We have shown how not all core-shell, fused-core particles, are the same, due to particle morphology and packing procedures there can be some significant differences in efficiency and backpressure displayed.

When undertaking method development selectivity is still an immensely important variable, we should not be reliant upon efficiency of these new particles alone.

2.6µm Fortis Speedcore provides higher efficiency than 3µm or 5µm particles providing greater sensitivity, speed and resolution of analysis.