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One of the biggest challenges in **reversed phase chromatography** has always been maintaining acceptable peak shape for strongly basic analytes. With typical silica-based reversed phase media, it is impossible to completely eliminate unbonded silanol groups, even with extensive end-capping. These residual silanols can interact via ion-exchange mechanisms with the charged basic functional groups on analyte molecules, leading to peak tailing and, in some cases, adsorption that can confound accurate quantitation.

Unwanted secondary interactions can be overcome through the use of ion-pairing or ion-masking agents, such as alkyl sulfonic acid additives (e.g. hexane sulfonic acid) or triethylamine (TEA). However, these additives are notoriously finicky and can lead to method robustness problems as subtle alterations in the concentrations can have dramatic effect on retention, as well as peak shape.

Peak tailing can be especially problematic when using typical LC-MS compatible mobile phases, such as 0.1 % formic acid or ammonium formate, as these volatile buffers do not seem to be as effective as UV compatible mobile phases, like potassium phosphate or trifluoroacetic acid (TFA) at blocking or minimizing silanol interactions.

To overcome this challenge, we have designed the **Luna® Omega** 1.6 µm PS C18 phase, which contains a proprietary positively charged functional group on the surface, in addition to the standard C18 bonding and trimethylsilane (TMS) end-capping. The presence of this positive charge on the surface results in a dramatic improvement in peak shape (less tailing and less band broadening) for basic analytes, even when using weak buffer systems such as 0.1 % formic acid. The improvement in performance for strong bases when using Luna Omega 1.6 µm PS C18 is especially apparent when you need to inject relatively large

amounts of an API to quantify low-level impurities, such as the impurity profile of the basic antihistamine diphenhydramine (p*K*a ~8.98), shown in the figures below.

Using a simple LC-MS compatible mobile phase of 0.1 % formic acid in water and acetonitrile under a simple linear gradient, a hybrid particle C18 **UHPLC column** (Waters® ACQUITY® BEH 1.7 µm C18; **Figure 1**) displays an exceptionally broad peak for the diphenhydramine API peak. However, when analyzed using the **Luna® Omega** 1.6 µm PS C18 column under identical running conditions (**Figure 2**), you can see the vast improvement in peak width, allowing full visualization and separation of the late eluting impurities following the main API peak, and even exposing a 3rd impurity not present on the Waters® ACQUITY® BEH 1.7 µm C18 column.

HPLC Conditions

Column:	As specified
Dimension:	50 x 2.1 mm
Mobile Phase:	A: 0.1 % Formic acid in Water B: 0.1 % Formic acid in Acetonitrile
Gradient:	Time (min) % B 0 5 5 95
Flow Rate:	0.5 mL/min
Temperature:	40 °C
Detection:	UV @ 254 nm
Sample:	1. Diphenhydramine

Figure 1.
Waters® ACQUITY® BEH 1.7 µm C18

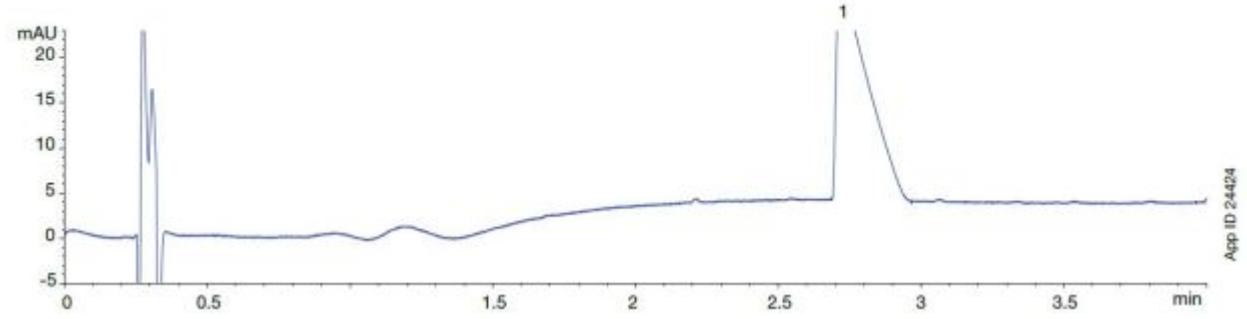
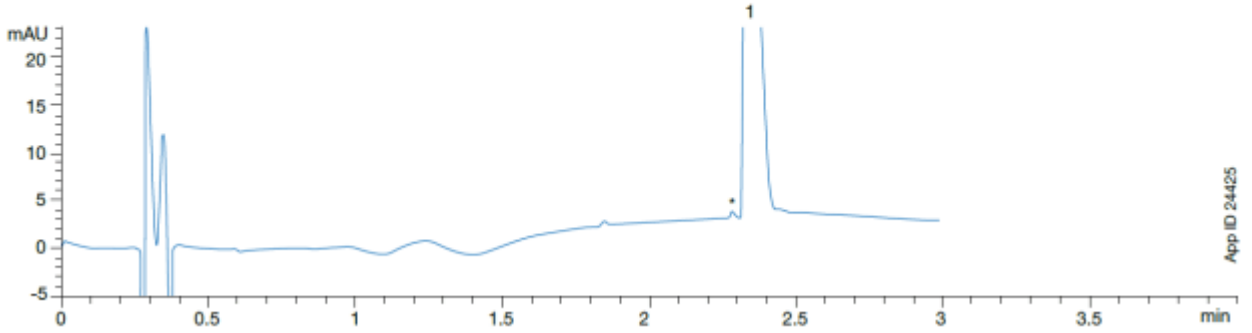


Figure 2.
Luna® Omega PS C18



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Summary

Article Name

Improve Performance of Strongly Basic Molecules

Description

Learn how to maintain acceptable peak shape for strongly basic analytes as well as improve performance for strongly basic molecules.