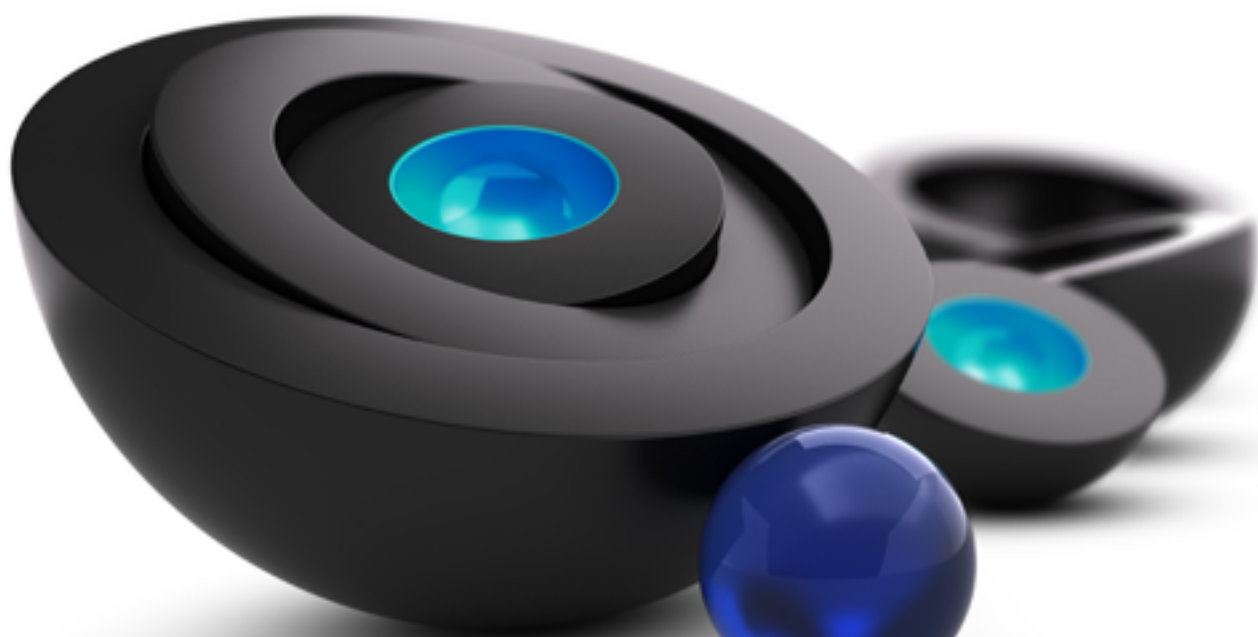


# **Dr. Maisch**

Any Column, Any Size, Any Media



**REPROSHELL®**  
Core-Shell columns

MADE BY DR. MAISCH



# CONTENT

- P 4                      REPROSHELL - CORE-SHELL-PARTICLES
- P 5                      REPROSHELL - VAN DEEMTER EQUATION  
REPROSHELL - VAN DEEMTER PLOT
- P 6                      A-TERM ( EDDY DIFFUSION, MULTI-PATH EFFECT )  
B-TERM ( LONGITUDINAL DIFFUSION )  
C-TERM ( MASS TRANSFER )
- P 7                      COMPARISON CORE-SHELL vs. FULLY POROUS PARTICLES
- P 8                      REPROSHELL - AVAILABLE PHASES
- P 9 - 11                REPROSHELL - EFFICIENCY
- P 12 - 15              AVAILABLE COLUMNS



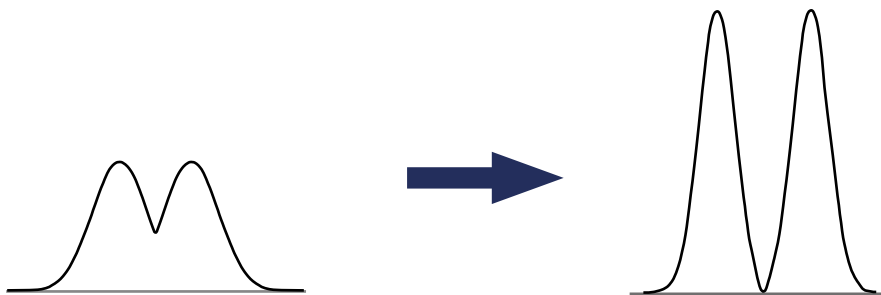
**REPROSHELL  
MADE BY DR. MAISCH**

From one of the biggest  
**H**igh-**P**erformance **L**iquid **C**hromatography (HPLC) and  
**U**ltra **H**igh-**P**erformance **L**iquid **C**hromatography (UHPLC)  
Column Manufacturers in Europe.

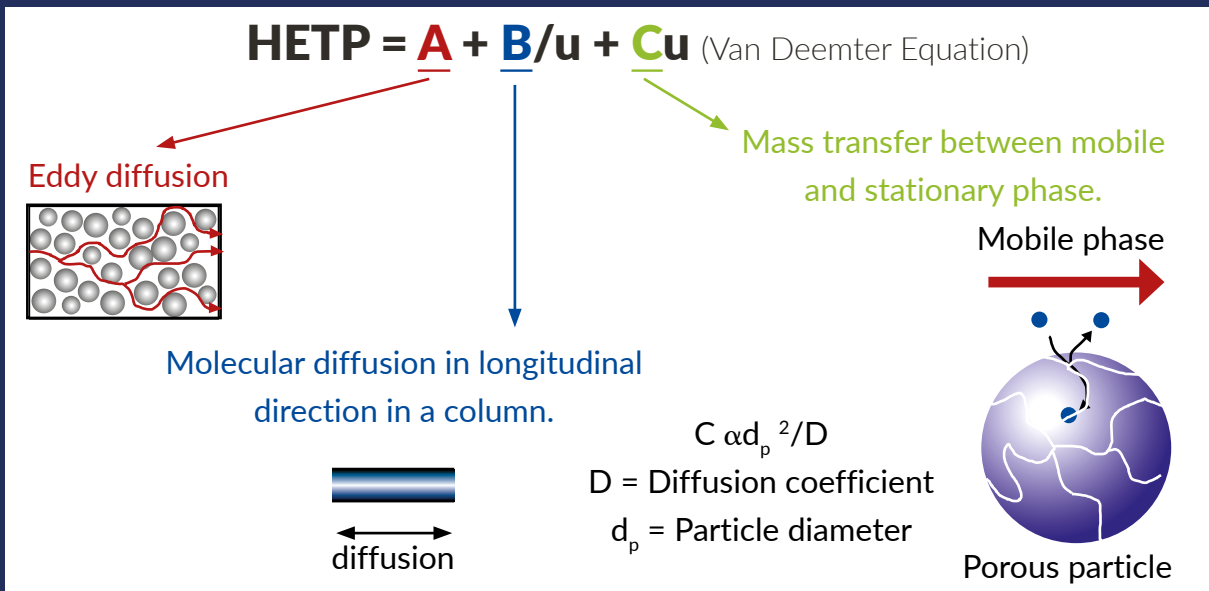
## Core - Shell particles



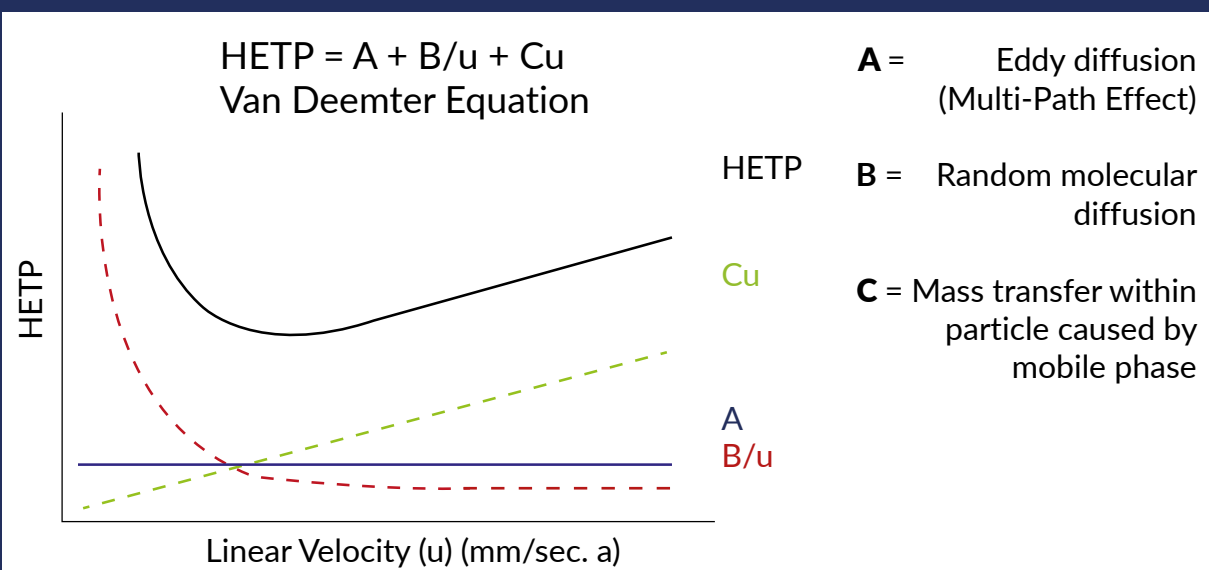
Core-Shell particles consist of a solid (non-porous) core surrounded by a porous layer (shell). They exhibit the same back pressure but higher efficiency compared to fully porous particles of the same particle size.



## ReproShell – van Deemter Equation



## van Deemter Plot



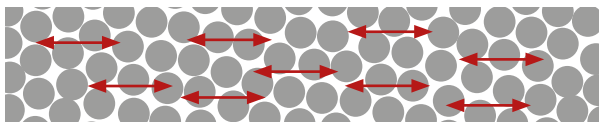
# REPROSHELL

## A-TERM (EDDY DIFFUSION, MULTI-PATH EFFECT)



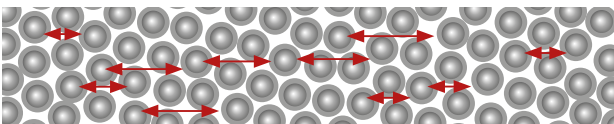
Core-Shell particles have a tighter particle size distribution which leads to a more uniform, organised bed structure. This reduces the impact of the multi-path effect.

## B-Term (Longitudinal Diffusion)



### Fully porous particles:

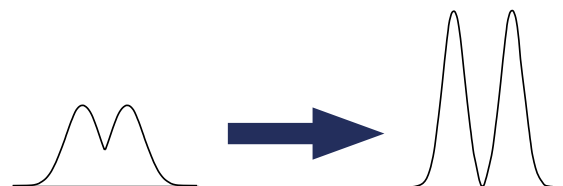
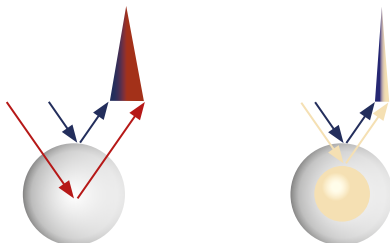
Diffusion takes place within the porous particle as well as in the interstitial space



### Core-Shell particles:

Non-porous core blocks longitudinal diffusion

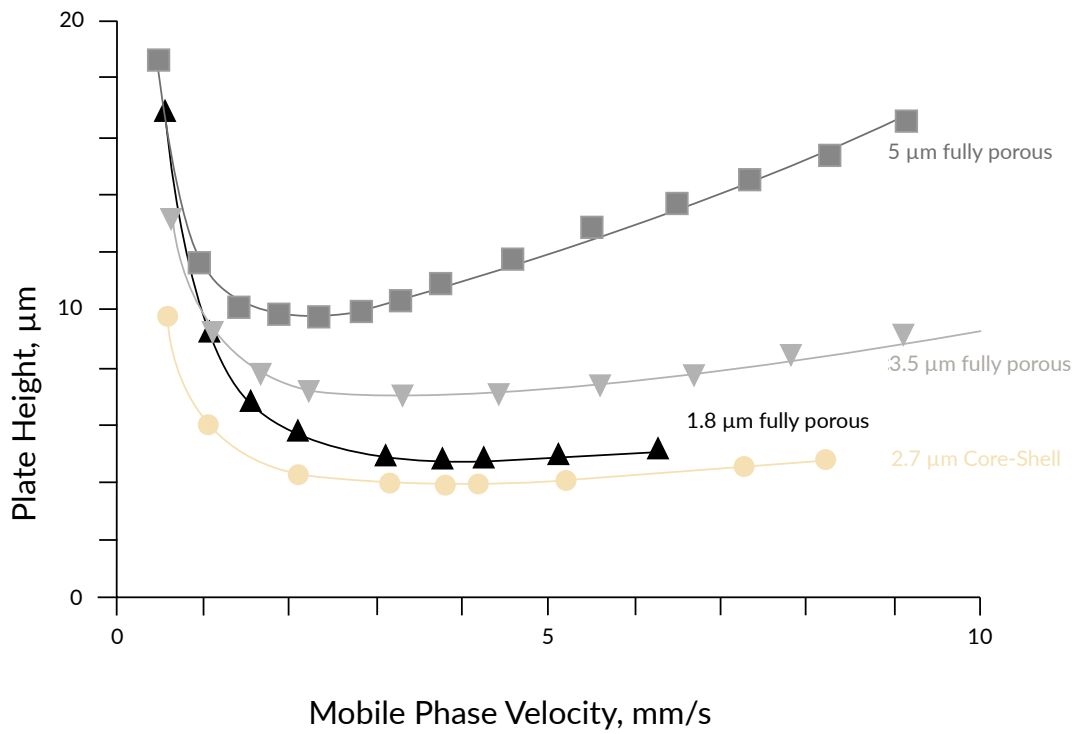
## C-Term (Mass transfer)



The non-porous core leads to a shorter diffusion path

# REPROSHELL

## COMPARISON CORE-SHELL VS. FULLY POROUS PARTICLES



## ReproShell – Available phases

Particle sizes 2.7  $\mu\text{m}$  and 5  $\mu\text{m}$

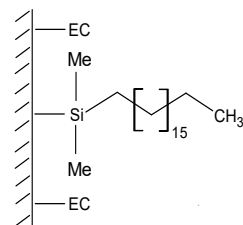
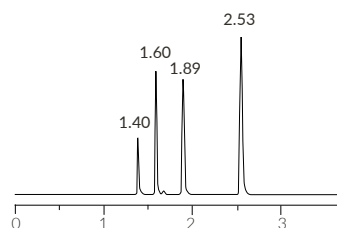
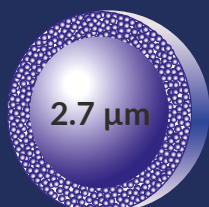
UPLC PERFORMANCE WITH STANDARD HPLC INSTRUMENT  
AND BACKPRESSURE  
VARIOUS SELECTIVITIES

- ODS-1 (highly retentive C18)
- ODS-3 (trifunctional C18)
- C8
- Biphenyl
- Phenylhexyl
- PFP (Penta fluoro phenyl)
- Silica
- HILIC

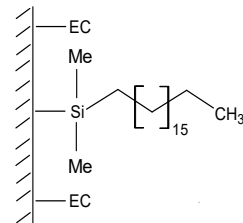
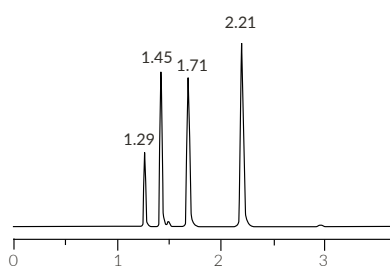
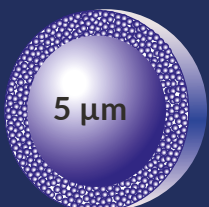


# REPROSHELL - EFFICIENCY

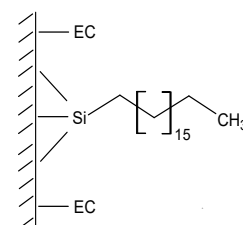
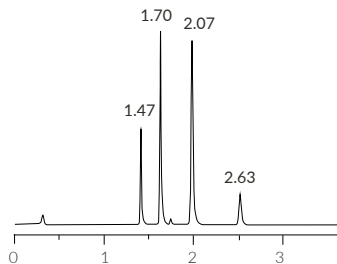
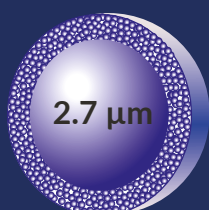
**ReproShell ODS -1**  
2.7  $\mu\text{m}$



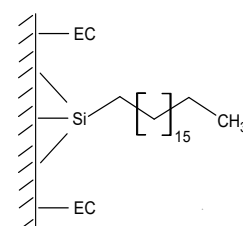
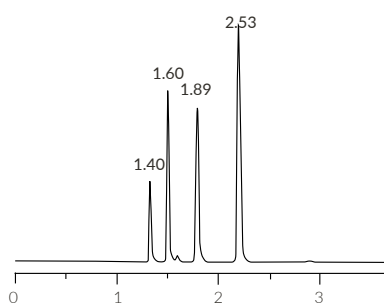
**ReproShell ODS -1**  
5  $\mu\text{m}$



**ReproShell ODS -3**  
2.7  $\mu\text{m}$

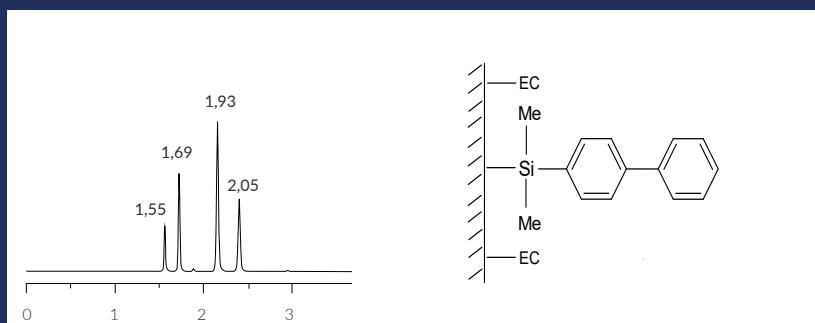
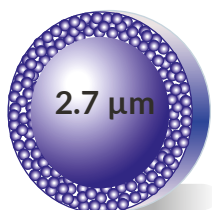


**ReproShell ODS -3**  
5  $\mu\text{m}$

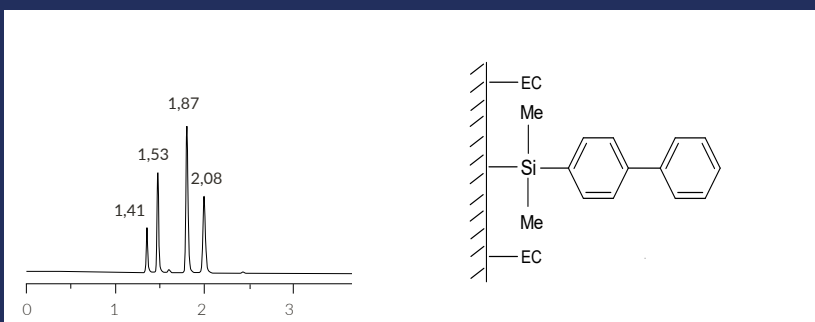
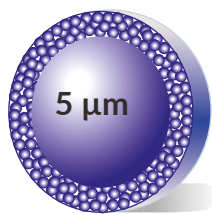


# REPROSHELL - EFFICIENCY

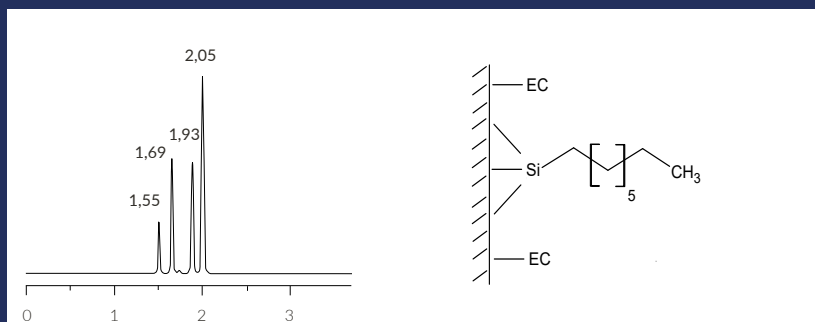
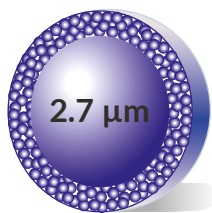
**ReproShell Biphenyl,**  
2.7  $\mu\text{m}$



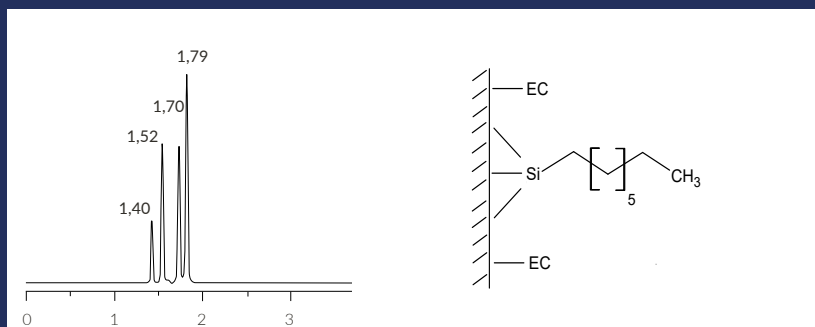
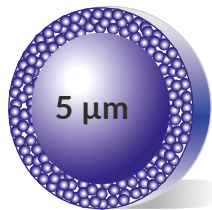
**ReproShell Biphenyl,**  
5  $\mu\text{m}$



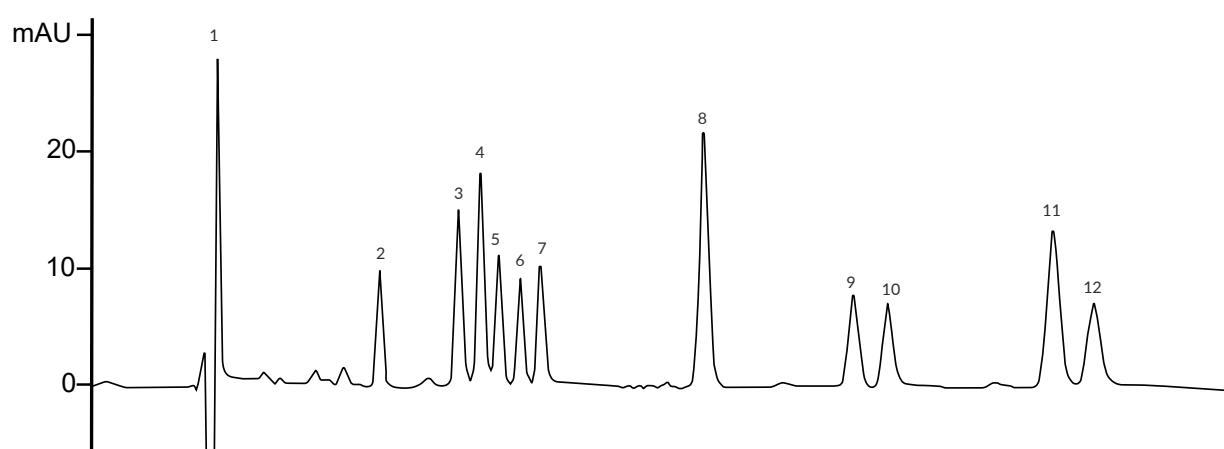
**ReproShell C8,**  
2.7  $\mu\text{m}$



**ReproShell C8,**  
5  $\mu\text{m}$



## HPLC-UV quantitation of 11 cannabinoids



1 - THCA  
2 - D9 THC  
3 - D8 THC  
4 - THCV

5 - CBGA  
6 - CBG  
7 - CBDA  
8 - CBD

9 - CBDV  
10 - CBN  
11 - CBC

|                                  |                                             |
|----------------------------------|---------------------------------------------|
| <b>Column:</b>                   | Reproshell ODS-1, 2.7 $\mu$ m, 150 x 4,6 mm |
| <b>Mobile Phase A:</b>           | Acetonitrile w / 0.1 % formic acid          |
| <b>Mobile Phase B:</b>           | Water w / 0.1 % formic acid                 |
| <b>Mobile Phase Composition:</b> | 75/25 - A/B - Isocratic                     |
| <b>Flow rate:</b>                | 2 mL/min                                    |
| <b>Back pressure:</b>            | 220-230 bar                                 |
| <b>Detection:</b>                | 228 nm                                      |
| <b>Run Time:</b>                 | 7 minutes                                   |
| <b>Reference Standard:</b>       | Cayman Chemical, Prod No. 32842             |

Chromatogramme and method courtesy of [www.seedlessanalytical.com](http://www.seedlessanalytical.com)

# AVAILABLE COLUMNS

## Coreshell RP-Phase with nonporous core and porous shell

| Particle size 5µm             | 20 x 2 mm      | 30 x 2 mm      | 50 x 2 mm      |
|-------------------------------|----------------|----------------|----------------|
| <b>ReproShell ODS-1</b>       | cs15.91.s0202  | cs15.91.s0302  | cs15.91.s0502  |
| <b>ReproShell ODS-3</b>       | cs15.93.s0202  | cs15.93.s0302  | cs15.93.s0502  |
| <b>ReproShell C8</b>          | cs15.8e.s0202  | cs15.8e.s0302  | cs15.8e.s0502  |
| <b>ReproShell Biphenyl</b>    | cs15.bpe.s0202 | cs15.bpe.s0302 | cs15.bpe.s0502 |
| <b>ReproShell Phenylhexyl</b> | cs15.ph.s0202  | cs15.ph.s0302  | cs15.ph.s0502  |
| <b>ReproShell PFP</b>         | cs15.pfp.s0202 | cs15.pfp.s0302 | cs15.pfp.s0502 |
| <b>ReproShell Silica</b>      | cs15.00.s0202  | cs15.00.s0302  | cs15.00.s0502  |

| Particle size 2,7 µm          | 20 x 3 mm      | 30 x 3 mm      | 50 x 3 mm      |
|-------------------------------|----------------|----------------|----------------|
| <b>ReproShell ODS-1</b>       | cs27.91.s0203  | cs27.91.s0303  | cs27.91.s0503  |
| <b>ReproShell ODS-3</b>       | cs27.93.s0203  | cs27.93.s0303  | cs27.93.s0503  |
| <b>ReproShell C8</b>          | cs27.8e.s0203  | cs27.8e.s0303  | cs27.8e.s0503  |
| <b>ReproShell Biphenyl</b>    | cs27.bpe.s0203 | cs27.bpe.s0303 | cs27.bpe.s0503 |
| <b>ReproShell Phenylhexyl</b> | cs27.ph.s0203  | cs27.ph.s0303  | cs27.ph.s0503  |
| <b>ReproShell PFP</b>         | cs27.pfp.s0203 | cs27.pfp.s0303 | cs27.pfp.s0503 |
| <b>ReproShell Silica</b>      | cs27.00.s0203  | cs27.00.s0303  | cs27.00.s0503  |

# AVAILABLE COLUMNS

| 75 x 2 mm      | 100 x 2 mm     | 125 x 2 mm     | 150 x 2 mm     | 5 x 2 mm 3/pck |
|----------------|----------------|----------------|----------------|----------------|
| cs15.91.s0702  | cs15.91.s1002  | cs15.91.s1202  | cs15.91.s1502  | cs15.91.v0002  |
| cs15.93.s0702  | cs15.93.s1002  | cs15.93.s1202  | cs15.93.s1502  | cs15.93.v0002  |
| cs15.8e.s0702  | cs15.8e.s1002  | cs15.8e.s1202  | cs15.8e.s1502  | cs15.8e.v0002  |
| cs15.bpe.s0702 | cs15.bpe.s1002 | cs15.bpe.s1202 | cs15.bpe.s1502 | cs15.bpe.v0002 |
| cs15.ph.s0702  | cs15.ph.s1002  | cs15.ph.s1202  | cs15.ph.s1502  | cs15.ph.v0002  |
| cs15.pfp.s0702 | cs15.pfp.s1002 | cs15.pfp.s1202 | cs15.pfp.s1502 | cs15.pfp.v0002 |
| cs15.00.s0702  | cs15.00.s1002  | cs15.00.s1202  | cs15.00.s1502  | cs15.00.v0002  |

| 75 x 3 mm      | 100 x 3 mm     | 125 x 3 mm     | 150 x 3 mm     | 5 x 3 mm 3/pck |
|----------------|----------------|----------------|----------------|----------------|
| cs27.91.s0703  | cs27.91.s1003  | cs27.91.s1203  | cs27.91.s1503  | cs27.91.v0003  |
| cs27.93.s0703  | cs27.93.s1003  | cs27.93.s1203  | cs27.93.s1503  | cs27.93.v0003  |
| cs27.8e.s0703  | cs27.8e.s1003  | cs27.8e.s1203  | cs27.8e.s1503  | cs27.8e.v0003  |
| cs27.bpe.s0703 | cs27.bpe.s1003 | cs27.bpe.s1203 | cs27.bpe.s1503 | cs27.bpe.v0003 |
| cs27.ph.s0703  | cs27.ph.s1003  | cs27.ph.s1203  | cs27.ph.s1503  | cs27.ph.v0003  |
| cs27.pfp.s0703 | cs27.pfp.s1003 | cs27.pfp.s1203 | cs27.pfp.s1503 | cs27.pfp.v0003 |
| cs27.00.s0703  | cs27.00.s1003  | cs27.00.s1203  | cs27.00.s1503  | cs27.00.v0003  |

# AVAILABLE COLUMNS

| Particle size 2,7 µm          | 20 x 4 mm      | 30 x 4 mm      | 50 x 4 mm      |
|-------------------------------|----------------|----------------|----------------|
| <b>ReproShell ODS-1</b>       | cs27.91.s0204  | cs27.91.s0304  | cs27.91.s0504  |
| <b>ReproShell ODS-3</b>       | cs27.93.s0204  | cs27.93.s0304  | cs27.93.s0504  |
| <b>ReproShell C8</b>          | cs27.8e.s0204  | cs27.8e.s0304  | cs27.8e.s0504  |
| <b>ReproShell Biphenyl</b>    | cs27.bpe.s0204 | cs27.bpe.s0304 | cs27.bpe.s0504 |
| <b>ReproShell Phenylhexyl</b> | cs27.ph.s0204  | cs27.ph.s0304  | cs27.ph.s0504  |
| <b>ReproShell PFP</b>         | cs27.pfp.s0204 | cs27.pfp.s0304 | cs27.pfp.s0504 |
| <b>ReproShell Silica</b>      | cs27.00.s0204  | cs27.00.s0304  | cs27.00.s0504  |

| Particle size 2,7 µm          | 20 x 4.6 mm    | 30 x 4.6 mm    | 50 x 4.6 mm    |
|-------------------------------|----------------|----------------|----------------|
| <b>ReproShell ODS-1</b>       | cs27.91.s0246  | cs27.91.s0346  | cs27.91.s0546  |
| <b>ReproShell ODS-3</b>       | cs27.93.s0246  | cs27.93.s0346  | cs27.93.s0546  |
| <b>ReproShell C8</b>          | cs27.8e.s0246  | cs27.8e.s0346  | cs27.8e.s0546  |
| <b>ReproShell Biphenyl</b>    | cs27.bpe.s0246 | cs27.bpe.s0346 | cs27.bpe.s0546 |
| <b>ReproShell Phenylhexyl</b> | cs27.ph.s0246  | cs27.ph.s0346  | cs27.ph.s0546  |
| <b>ReproShell PFP</b>         | cs27.pfp.s0246 | cs27.pfp.s0346 | cs27.pfp.s0546 |
| <b>ReproShell Silica</b>      | cs27.00.s0246  | cs27.00.s0346  | cs27.00.s0546  |

# AVAILABLE COLUMNS

| 75 x 4 mm      | 100 x 4 mm     | 125 x 4 mm     | 150 x 4 mm     | 5 x 4 mm 3/pck |
|----------------|----------------|----------------|----------------|----------------|
| cs27.91.s0704  | cs27.91.s1004  | cs27.91.s1204  | cs27.91.s1504  | cs27.91.v0004  |
| cs27.93.s0704  | cs27.93.s1004  | cs27.93.s1204  | cs27.93.s1504  | cs27.93.v0004  |
| cs27.8e.s0704  | cs27.8e.s1004  | cs27.8e.s1204  | cs27.8e.s1504  | cs27.8e.v0004  |
| cs27.bpe.s0704 | cs27.bpe.s1004 | cs27.bpe.s1204 | cs27.bpe.s1504 | cs27.bpe.v0004 |
| cs27.ph.s0704  | cs27.ph.s1004  | cs27.ph.s1204  | cs27.ph.s1504  | cs27.ph.v0004  |
| cs27.pfp.s0704 | cs27.pfp.s1004 | cs27.pfp.s1204 | cs27.pfp.s1504 | cs27.pfp.v0004 |
| cs27.00.s0704  | cs27.00.s1004  | cs27.00.s1204  | cs27.00.s1504  | cs27.00.v0004  |

| 75 x 4.6 mm    | 100 x 4.6 mm   | 125 x 4.6 mm   | 150 x 4.6 mm   | 5 x 4.6mm 3/pck |
|----------------|----------------|----------------|----------------|-----------------|
| cs27.91.s0746  | cs27.91.s1046  | cs27.91.s1246  | cs27.91.s1546  | cs27.91.v0046   |
| cs27.93.s0746  | cs27.93.s1046  | cs27.93.s1246  | cs27.93.s1546  | cs27.93.v0046   |
| cs27.8e.s0746  | cs27.8e.s1046  | cs27.8e.s1246  | cs27.8e.s1546  | cs27.8e.v0046   |
| cs27.bpe.s0746 | cs27.bpe.s1046 | cs27.bpe.s1246 | cs27.bpe.s1546 | cs27.bpe.v0046  |
| cs27.ph.s0746  | cs27.ph.s1046  | cs27.ph.s1246  | cs27.ph.s1546  | cs27.ph.v0046   |
| cs27.pfp.s0746 | cs27.pfp.s1046 | cs27.pfp.s1246 | cs27.pfp.s1546 | cs27.pfp.v0046  |
| cs27.00.s0746  | cs27.00.s1046  | cs27.00.s1246  | cs27.00.s1546  | cs27.00.v0046   |

# Dr. Maisch

Any Column, Any Size, Any Media

Distributor:



Dr. Maisch HPLC GmbH  
Beim Brückle 14  
D-72119 Ammerbuch  
T: +49 (0) 7073 50357  
F: +49 (0) 7073 4216  
[www.dr-maisch.com](http://www.dr-maisch.com)  
[www.modcol.com](http://www.modcol.com)  
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