

Develosil®



Reverse Phase Method Development

Small Organic Molecules (M.W.<5,000)

First Selection:

- Develosil HSR C18
- Develosil HSR AQ C18

Accelerated Elution:

- Develosil HSR C8
- Develosil HSR C1

Large Organic Molecules (M.W.>5,000)

First Selection:

- Develosil HSR C18 peptide
- Develosil HSR AQ C18protein
- Develosil 300 ODS-HG
- Develosil 300 ODS-UG

High Recovery:

- Develosil 300 C8-HG
- Develosil 300 C4-HG

Normal Phase Method Development

Small Organic Molecules (M.W.<5,000)

Silica Phase Chemistry:

- Develosil Silica 30
- Develosil Silica 60
- Develosil Silica 100

Amino Phase Chemistry:

- Develosil NH₂
- Develosil ANIDIUS

Diol Phase Chemistry:

- Develosil 100 Diol

Large Organic Molecules
(M.W.>5,000)

Diol Phase Chemistry:

- Develosil 300 Diol

SEC Method Development

Small Organic Molecules (M.W.<5,000)

Diol Phase Chemistry:

- Develosil 100 Diol

Large Organic Molecules (M.W.>5,000)

Diol Phase Chemistry:

- Develosil 300 Diol

Develosil Silica Gel

	Particle size	Surface area (m ² /g)	Pore volume (mL/g)	Pore diameter (nm)
Develosil 30	3 um, 5 um, 15/30 um	700	0.5	3
Develosil 60	3 um, 5 um, 15/30 um	500	0.75	6
Develosil 100	3 um, 5 um, 15/30 um	350	1.0	12
Develosil SILICA-HILIC (ρ)	3 um, 5 um	300	1.15	14

Develosil 30, 60 and 100 silica gels are type A silica.

Develosil SILICA-HILIC(I) is type B and also for HILIC mode.

Expression of Stationary Phases

“Develosil” + stationary phase name (ODS-UG or C8-UG) + particle size (um)

e.g. Develosil C8-UG-5, Develosil ODS-HG-3, Develosil ODS-UG-5, Develosil C30-UG-5

Dimension of Develosil Columns

Available inner diameters are shown as follows:

Semi-micro column: 1.0 mm i.d., 1.5 mm i.d., 2.0 mm i.d.

Conventional column: 3.0 mm i.d., 4.0 mm i.d., 4.6 mm i.d., 6.0 mm i.d.

Preparative column: 8.0 mm i.d., 10 mm i.d., 20 mm i.d., 28 mm i.d.

Large scale preparative column: 50 mm i.d. (for >10 or 15/30 um particle)

Develosil HPLC Columns

- Columns in 3 kinds of mode such as Reversed, Gel filtration and Normal phase are commercially available.
- We have 5 kinds of C30 phase
- 6 kinds of C18 (ODS) phase
- 2 kinds of C8 phase
- 300 ODS-HG, 300C8-HG and 300C4-HG phase have pores with 25 nm diameter and are for separation of proteins or polypeptides.
- 4 kinds of silica gel. Especially, Develosil 30 (silica gel) has 3 nm pores. Its pore size is the smallest, and it has very large surface area and shows large retention.

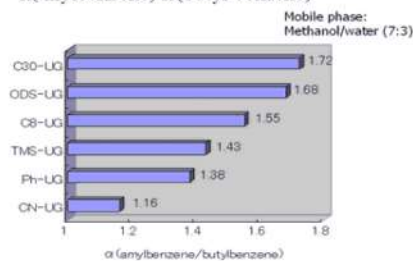
MODE	Ligand	PACKING MATERIAL	PARTICLE SIZE
Reversed phase	C30	Develosil C30-UG	3 um, 5 um
		Develosil PRPAQUEOUS	3 um, 5 um
		Develosil Combi-RP	3 um, 5 um
		Develosil RPFULLERENE	3 um, 5 um
		Develosil RPAQUEOUS-AR	3 um, 5 um
		Develosil ERP20	15/30 um
	C18	Develosil ODS-UG	3 um, 5 um and 15/30 um
		Develosil ODS-HG	3 um, 5 um and 15/30 um
		Develosil ODS-MG	3 um, 5 um and 15/30 um
		Develosil ODS-SR	3 um, 5 um and 15/30 um
		Develosil PAHS	3 um, 5 um
		Develosil 300ODS-HG	5 um
		Develosil C8-UG	3 um, 5 um
C8	Develosil 300C8-HG	5 um	
	Develosil 300C4-HG	5 um	
C4	Develosil 300C4-HG	5 um	
	Develosil TMS-UG	3 um, 5 um	
Phenyl	Develosil Ph-UG	3 um, 5 um	
	Cyano	Develosil CN-UG	5 um
Gel filtration phase	Diol	Develosil 300Diol	5 um
		Develosil 100Diol	5 um
Normal phase	Cyano	Develosil CN-UG	5 um
		Develosil NH2	5 um
	None (Silica)	Develosil 30	3 um, 5 um and 15/30 um
		Develosil 60	3 um, 5 um and 15/30 um
		Develosil 100	3 um, 5 um and 15/30 um
	Develosil SILICA-HILIC(I) and (II)	3 um, 5 um	

UG Series Phases

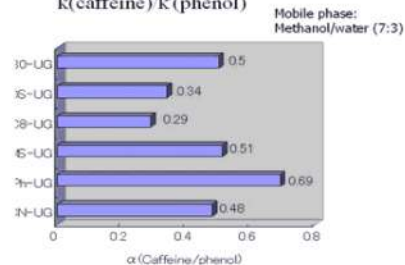
All phase are monomerically bonded and fully endcapped on the same silica base material. Therefore, UG phases can be compared concerning the difference of separation between each ligand.

	Particle size	Ligand	End-capping (TMS)	Carbon content (%)	Silica		
					Surface area (m ² /g)	Pore volume (mL/g)	Pore diameter (nm)
Develosil C30-UG	3 um, 5 um	-Si (CH ₃) ₂ C ₃₀ H ₆₁	Double	18	300	1.15	14
Develosil ODS-UG	3 um, 5 um	-Si (CH ₃) ₂ C ₁₈ H ₃₇	Double	18	300	1.15	14
Develosil C8-UG	3 um, 5 um	-Si (CH ₃) ₂ C ₈ H ₁₇	Double	11	300	1.15	14
Develosil TMS-UG	3 um, 5 um	-Si (CH ₃) ₃	Double	4.5	300	1.15	14
Develosil Ph-UG	3 um, 5 um	-Si (CH ₃) ₂ C ₆ H ₅	Double	8	300	1.15	14
Develosil CN-UG	5 um	-Si (CH ₃) ₂ C ₃ H ₆ CN	Double	7	300	1.15	14

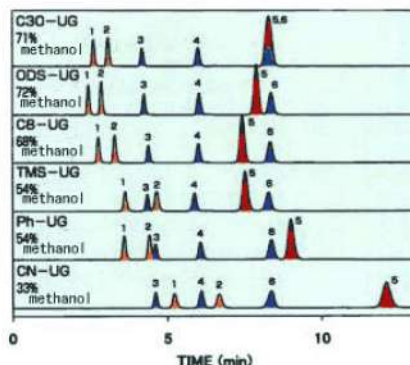
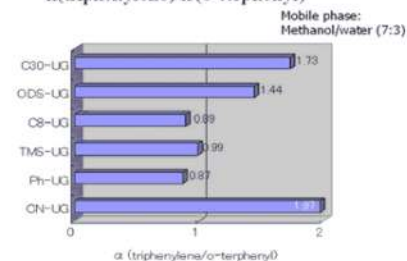
Hydrophobic consistency
k(amylobenzene)/k(butyl benzene)



Hydrogen bonding capacity
k(caffeine)/k(phenol)



Steric selectivity
k(triphenylene)/k(o-terphenyl)



Comparison of chromatograms for standard samples

Conditions
Column size: 150 x 4.6 mm i.d.
Mobile phase: Methanol/ water (methanol ratio is described in figure) (Retention time of peak No. 6 was adjusted at 8.5 min.)

Flow rate: 1.0 mL/min
Temperature: 30 °C
Detection: UV at 254 nm

Sample
1 = Methyl parabene
2 = Ethyl parabene
3 = Benzene
4 = Toluene
5 = Naphthalene
6 = Ethylbenzene

Comparison of Develosil ODS (C18) Columns

	ODS-UG	ODS-HG	ODS-MG	ODS-SR	PAHS
Functionality of C18	Monofunctional	Trifunctional	Difunctional	Difunctional	Trifunctional and polymeric
Ligand density (umol/g)	3.2	3.4	1.6	—	4.5
Carboncontent (%)	18	18	15	18	23
Endcapping (TMS)	Yes	Yes	Yes	Yes	No
Pore diameter of silica (nm)	14	14	10	8	12
Surface area of silica (m ² /g)	300	300	450	—	350
Hydrogen bonding capacity k(caffeine)/k(phenol)	0.38	0.38	0.48	0.48	0.40
Hydrophobic consistency k(amylobenzene)/k(butyl benzene)	1.59	1.58	1.60	1.66	1.58
Steric selectivity k(triphenylene)/k(o-terphenyl)	1.50	1.58	1.20	1.21	2.72
Stability	Very good (pH2-10)	Very good (pH1-9)	Good (pH2-7.5)	Good (pH2-7.5)	Good (pH2-7.5)
Retention	Moderate	Moderate	Long (1.3 folds)	Very long (2 folds)	Moderate

The characteristic of each ODS phase is showed in the above table.

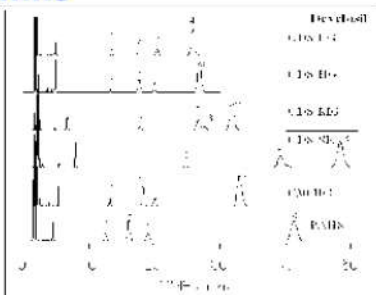
Develosil ODS-UG is the most stable under alkaline conditions, and can be used under pH2 - 10.

Develosil ODS-HG is the most stable under acidic conditions (pH1 - 9), and can be used even under 0.5% TFA.

Develosil ODS-MG shows medium performance and suitable for all samples and time to equilibrate is very quick.

Develosil ODS-SR shows the longest retention in our ODS phases, and suitable for LC/MS because much organic solvent obtain high sensitivity.

Develosil PAHS is a real polymeric ODS, and has the highest steric selectivity.



Analytical Conditions
Column dimension: 150 x 4.6 mm i.d.
Mobile phase: Methanol/ water = 75 / 25
Temperature: 30 °C
Detection: UV at 254 nm
Sample: 1 = Butylbenzene
2 = o-Terphenyl
3 = Amylobenzene
4 = Triphenylene