NOMURA CHEMICAL

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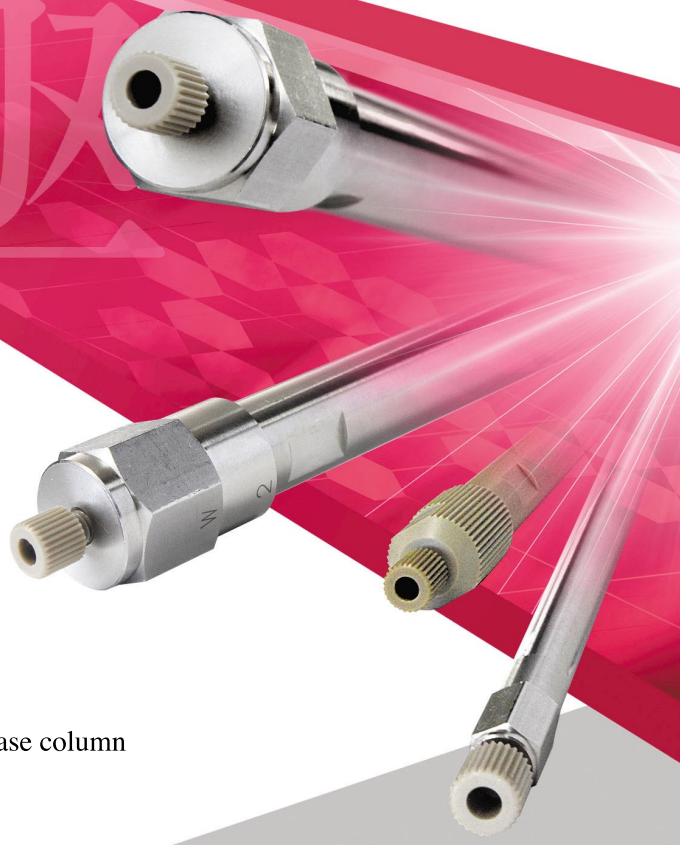

For High Performance Liquid Chromatography

HSR AQ C18 C1

Develosil

High-polarity compounds were separated on a reverse phase column

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The Develosil HSR series was developed for maximum retention and separation, durability and ease of use. This feature is widely applied to research and development and quality control. HILIC may also be used to analyze highly polar compounds. However, We would like to analyze with a familiar reversed phase column. Therefore Develosil HSR AQ C18 and C1 appeared !!

Specification of HSR series silica gel base material

In order to keep the highly polar compound in the reverse phase column, it is necessary to select a column that can be used in 100% water mobile phase. In particular, HSR C1 is an image with a short alkyl chain and weak retention, but it has become an epoch-making column overturning common sense by our synthesis technology.

There are many cases where HILIC column is used to hold highly polar compounds, but by all means, please experience this column which made full use of stability and ease of use unique to reversed phase.

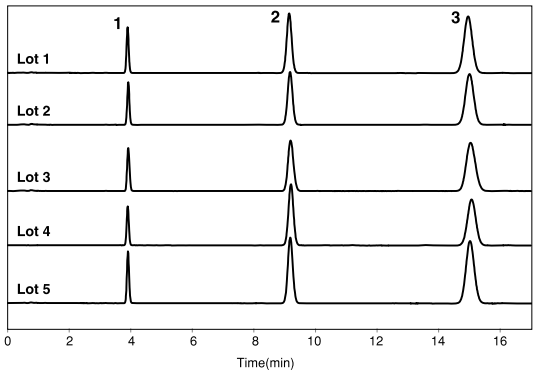
仕様

	HSR AQ C18	HSR C1
Base	High purity silica gel	
Phase	C18	C1
Particle size	3um, 5um	
Surface area	450m^2/g	
Pore size	10nm	
Endcapped	Yes	
Carbon load	17%	6.5%
pH range	pH2-9	pH2-8

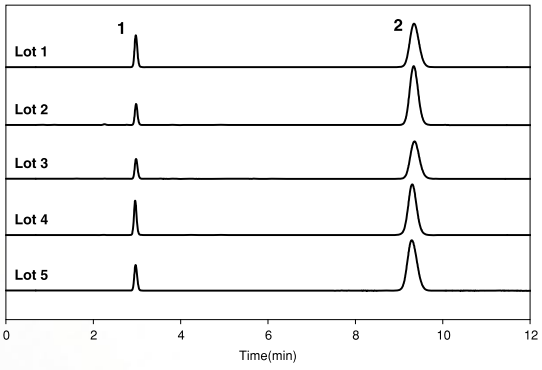
Reproducibility between lots

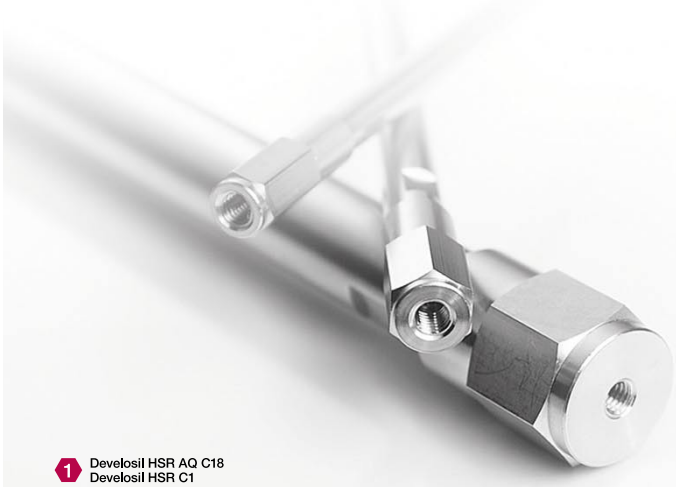
All of the Develosil series are produced by Nomura Chemical Co., Ltd. Therefore, quality control can be evaluated in detail. Columns with small difference between lots always maintain high reproducibility.

Develosil HSR AQ C18



Develosil HSR C1

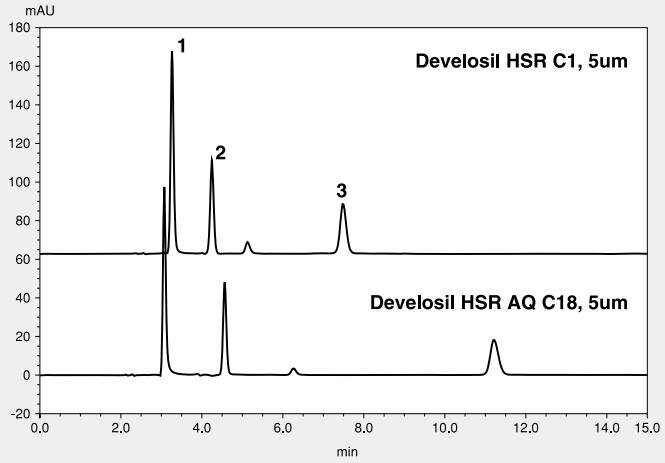




Sharp peak for every compound

Sharp peaks give trust and peace of mind to those who analyze. HSR series pursues this sharpness by developing original end cap technology.

[Peak shape of acidic compound]



Analytical conditions:

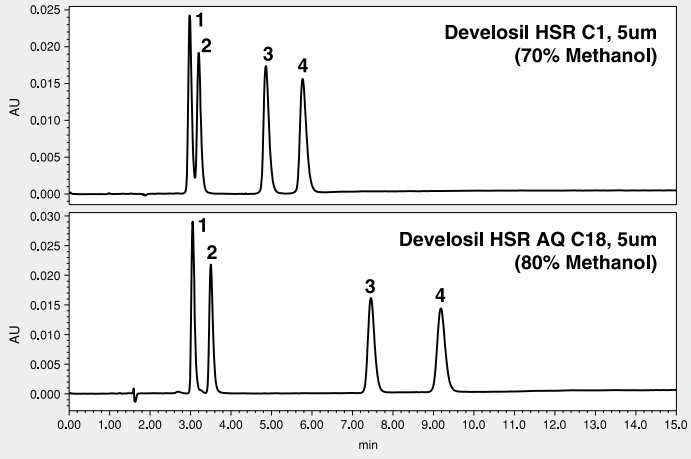
Column	: **Develosil HSR C1, 5um**
	Develosil HSR AQ C18, 5um
Column size	: 4.6x150mm
Mobile phase	: 25mM $(NH_4)_2HPO_4$, pH2.0
Flow rate	: 1.0mL/min
Temperature	: 40℃
Detection	: 210nm
Injection volume	: 2.0uL
Sample	: **1.** Formic acid (5.0uL/ml)
	2. Acetic acid (5.0uL/mL)
	3. Propionic acid (5.0uL/mL)

■The tailing factor of each peak

	HSR C1	HSR AQ C18
Formic acid	**1.14**	**1.28**
Acetic acid	1.06	1.07
Propionic acid	1.09	1.14

Formic acid is a tailing compound in the analysis of organic acids. Therefore, Develosil HSR AQ C18 and HSR C1 are designed to suppress tailing even with these compounds. In addition, since 100% water mobile phase can be used, the compound can be held to the maximum.

[Peak shape of basic compound]



Analytical conditions:

Column	: **Develosil HSR C1, 5um**
	Develosil HSR AQ C18, 5um
Column size	: 4.6x150mm
Mobile phase	: **HSR C1, 5um**
	MeOH/25mM (NH4)2HPO4, pH2.0=70/30
	HSR AQ C18, 5um
	MeOH/25mM $(NH_4)_2HPO_4$, pH2.0=80/20
Flow rate	: 1.0mL/min
Temperature	: 40℃
Detection	: 254nm
Injection volume	: 2.0uL
Sample	: **1.** Desipramine HCl (64ug/ml)
	2. Nortriptyline HCl (52ug/mL)
	3. Imipramine HCl (54ug/mL)
	4. Amitriptyline HCl (53ug/mL)

■The tailing factor of each peak

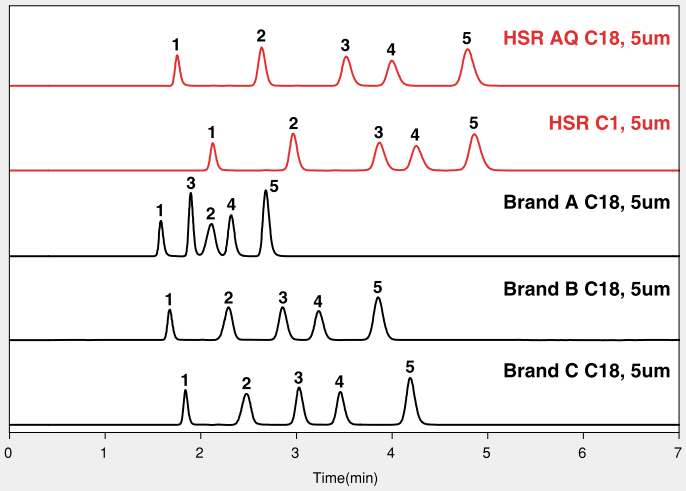
	HSR C1	HSR AQ C18
Desipramine HCl	N.D	1.26
Nortriptyline HCl	N.D	1.14
Imipramine HCl	1.25	1.11
Amitriptyline HCl	**1.18**	**1.15**

The basic compound greatly affects the peak shape. The Develosil HSR series including Develosil HSR AQ C18 and HSR C1 devises end cap processing to solve these problems. The retention of the compound varies depending on the length of the alkyl chain, but one characteristic is that a stress-free, sharp peak is obtained for many compounds.

Separation and retention under extreme conditioning

It is difficult to separate the components eluted at the front part in the reversed phase column. Therefore, condition examination is also the limit. The 100% water mobile phase shows the maximum retention and the others are only the temperature and the column length. In such extreme conditions, Develosil HSRAQ C18 and HSR C1 are powerful. Even when compared with other company column in ribonucleotide analysis example, retention is stronger and separation degree is good. In particular, retention and resolution in HSR C1 show maximum performance and give beneficial results. If retention and separation can be achieved, organic solvents may be added. Furthermore, by combining conditions such as gradient elution, it is possible to expect med development for improving the sensitivity of LC / MS.

[Analytical example of ribonucleotides with aqueous 100% mobile phase]

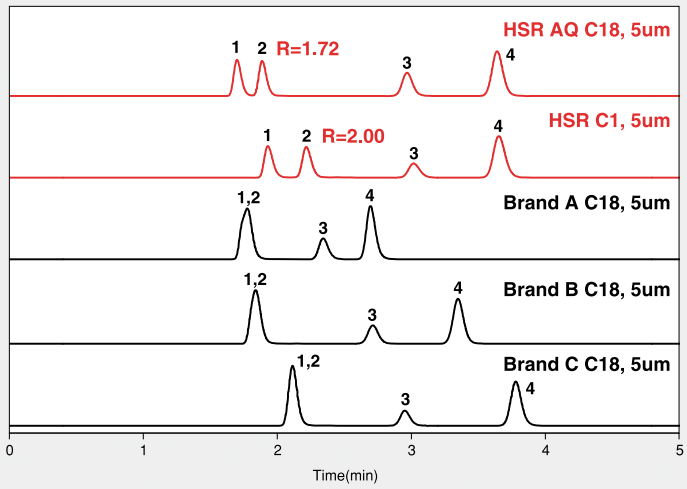


Although HSR AQ C18 and C1 showed good peak shapes for all peaks without using high concentration buffer solution, IMP (2) tended to be broad in other companies' columns.

Analytical conditions:

Column	: **Develosil HSR AQ C18, 5um** **Develosil HSR C1, 5um** Brand A C18, 5um Brand B C18, 5um Brand C C18, 5um
Column size	: 4.6x150mm
Mobile phase	: 25mM $(NH_4)_2HPO_4$, pH7.0
Flow rate	: 1.0mL/min
Temperature	: 40℃
Detection	: UV254nm
Injection volume	: 2.0uL
Sample	: **1.** CMP (0.50mg/mL) **2.** IMP (0.54mg/mL) **3.** ATP (0.57mg/mL) **4.** ADP (0.53mg/mL) **5.** AMP (0.69mg/mL)

[Separation between highly polar compounds]



Separation between highly polar compounds is also good, making it easier to analyze more components.

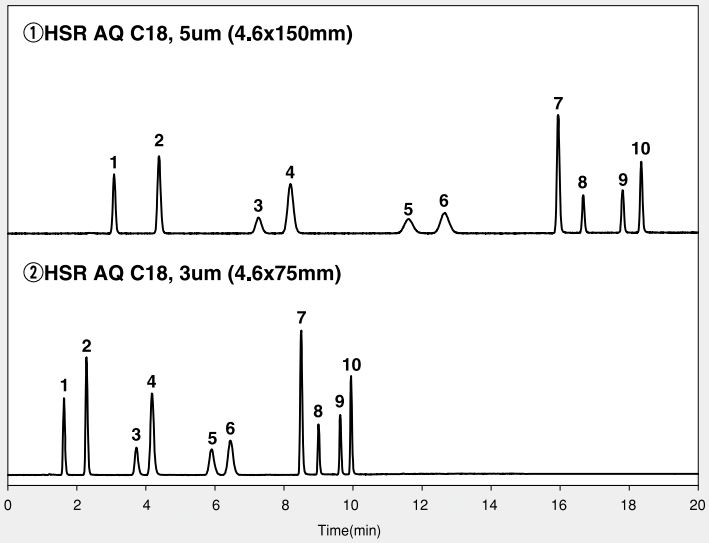
Analytical conditions:

Column	: **Develosil HSR AQ C18, 5um** **Develosil HSR C1, 5um** Brand A C18, 5um Brand B C18, 5um Brand C C18, 5um
Column size	: 4.6x150mm
Mobile phase	: 0.1%H_3PO_4
Flow rate	: 1.0mL/min
Temperature	: 40℃
Detection	: UV210nm
Injection volume	: 2.0uL
Sample	: **1.** Cytosine (0.07mg/mL) **2.** Allantoin (0.33mg/mL) **3.** Ascorbic acid (0.51mg/mL) **4.** Uracil (0.22mg/mL)

Briefly transfer method

Reducing analysis time greatly improves the efficiency of the analyzer. The Develosil series also conducts rigorous evaluations on particle size, so accurate time reduction is possible.

[Nucleic Acid Related Compound - Example of Method Transfer to Reduce Analysis Time]

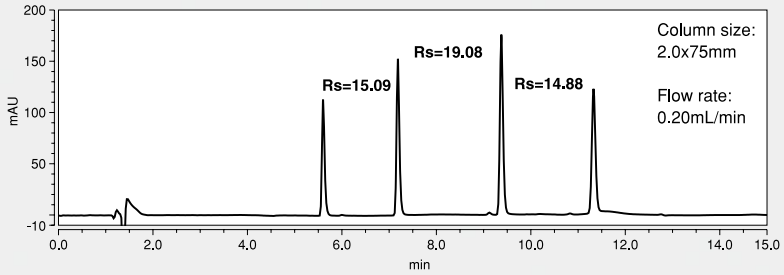


Analytical conditions:

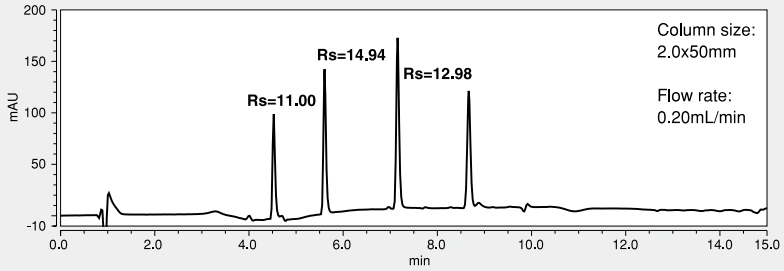
Column	: ①**Develosil HSR AQ C18, 5um (4.6x150mm)**
	: ②**Develosil HSR AQ C18, 3um (4.6x75mm)**
Mobile phase	: A) 50mM $HCOONH_4$ (pH 7.0)
	B) Acetonitrile
Gradient	: ①B)0%-20%(10-20min)
	: ②B)0%-20%(5-10min)
Flow rate	: 1.0mL/min
Temperature	: 30℃
Detection	: UV254nm
Sample	: **1**. Cytosine (0.05mg/mL)
	2. Uracil (0.05mg/mL)
	3. Cytidine (0.05mg/mL)
	4. Guanine (0.08mg/mL)
	5. Uridine (0.06mg/mL)
	6. Thymine (0.05mg/mL)
	7. Adenine (0.06mg/mL)
	8. Guanosine (0.06mg/mL)
	9. Thymidine (0.06mg/mL)
	10. Adenosine (0.05mg/mL)
Injection volume	: 2.0uL

By changing particle size from 5 um, 4.6 x 150 mm to 3 um, 4.6 x 75 mm, analysis time can be shortened to about 1/2. In addition, by changing the inner diameter to 3.0 mm or 2.0 mm, solvent saving can be realized. In the Develosil HB series, the column pressure resistance is set to 50 MPa while the particle size is 3 um. Therefore, in addition to shortening of time + solvent saving, further speeding up becomes possible and efficiency can be improved.

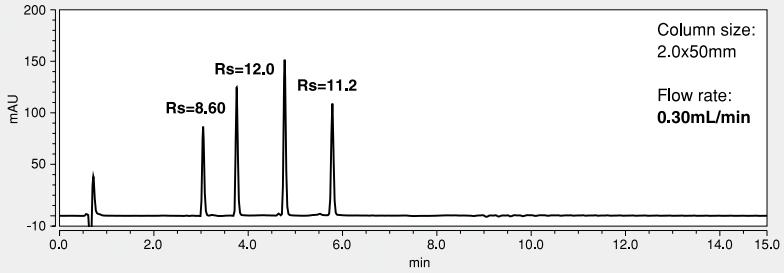
[Analysis of flavonoids - Transfer to improve throughput]



Time (min)	Flow (mL/min)	%A	%B	Curve
0.00	0.20	100	0	5
7.50	0.20	20	80	5
14.0	0.20	20	80	5
14.1	0.20	100	0	5

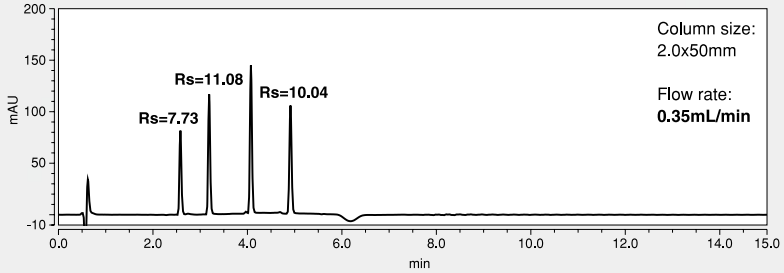


Time (min)	Flow (mL/min)	%A	%B	Curve
0.00	0.20	100	0	5
5.00	0.20	20	80	5
10.0	0.20	20	80	5
10.1	0.20	100	0	5



Time (min)	Flow (mL/min)	%A	%B	Curve
0.00	0.30	100	0	5
3.35	0.30	20	80	5
6.7	0.30	20	80	5
6.75	0.30	100	0	5

※From the condition of 2.0 x 50 mm simulate the particle size 2.0 um by method transfer



Time (min)	Flow (mL/min)	%A	%B	Curve
0.00	0.35	100	0	5
2.85	0.35	20	80	5
5.65	0.35	20	80	5
5.70	0.35	100	0	5

※From the condition of 2.0 x 50 mm simulate the particle size 1.7 um by method transfer

Analytical conditions:

Column	: **Develosil HSR AQ C18, 3um**
Mobile phase	: A) 0.2% HCOOH in Water
	B) 0.2% HCOOH in Acetonitrile
Temperature	: 40℃
Detection	: UV 254nm
Sample	: **1.** Puerarin (0.025mg/mL)
	2. Daidzein (0.025mg/mL)
	3. Biochanin A (0.027mg/mL)
	4. Ipriflavone (0.025mg/mL)
Injection volume	: 1.0 uL

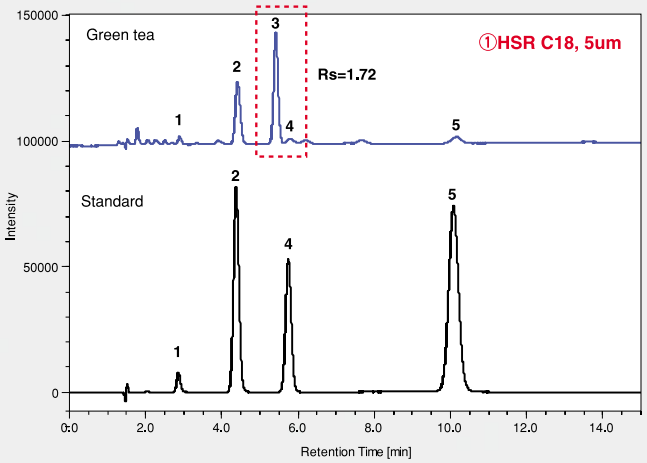
Study on speeding up flavonoid analysis with 3 um particle diameter. By combining flow rate and gradient conditions, analysis time can be greatly shortened and more samples can be analyzed.When using 4.6 x 75 mm column as the starting point, the amount of solvent used can be reduced to about 1/5. In this analysis example, sufficient separation is secured, so further reduction in time can be realized.

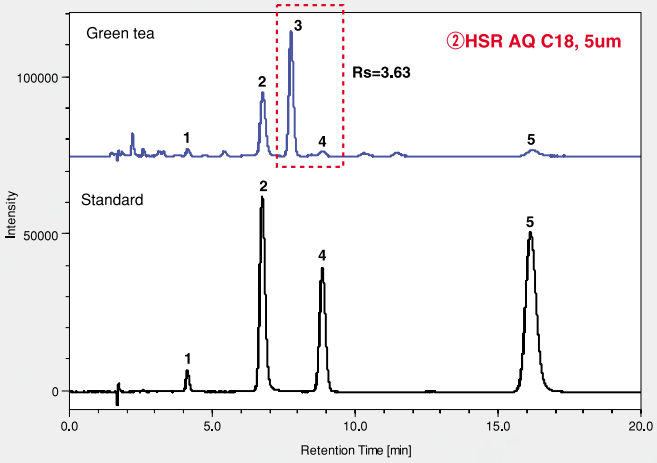
※This data uses a semi-micro flow cell, a thin pipe with a small inner diameter so that the dead volume is not as much as possible.

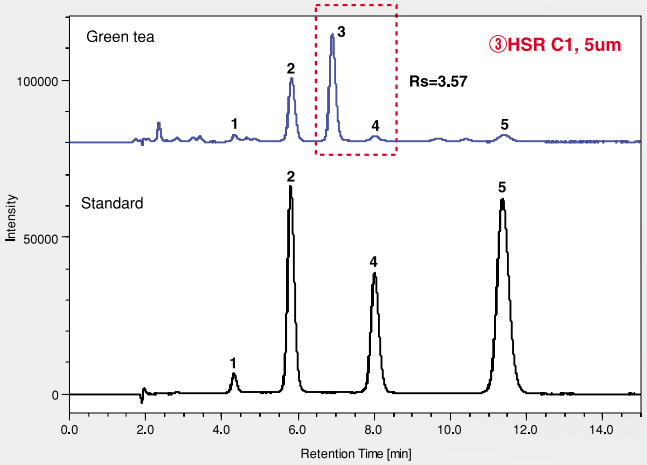
Various applications

In the Develosil HSR series you can obtain valuable data in all fields such as medicine, food and environment.

[HSR series Separation comparison of green tea catechins]





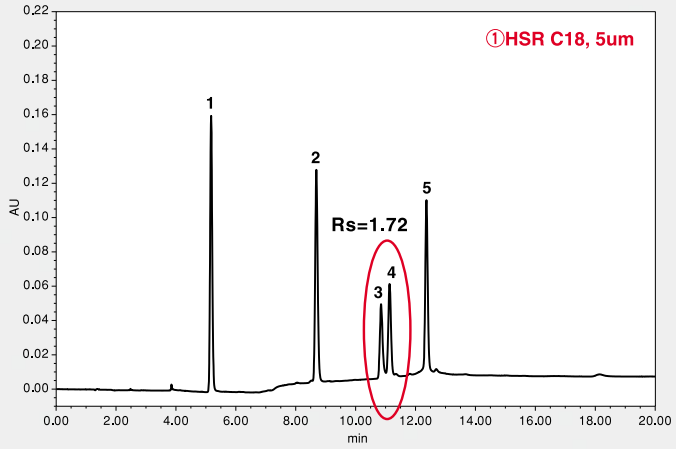


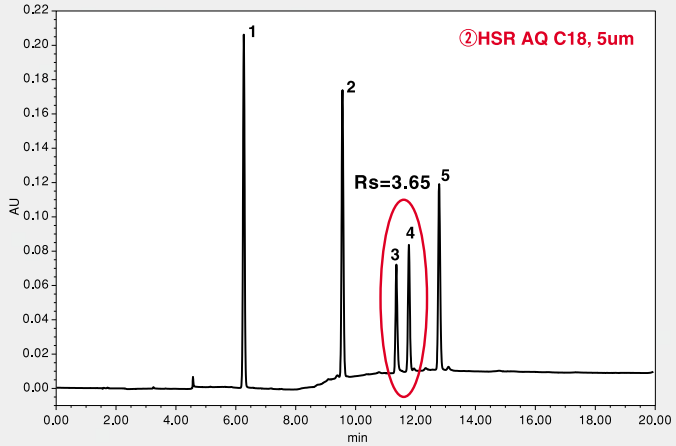
Analytical conditions:

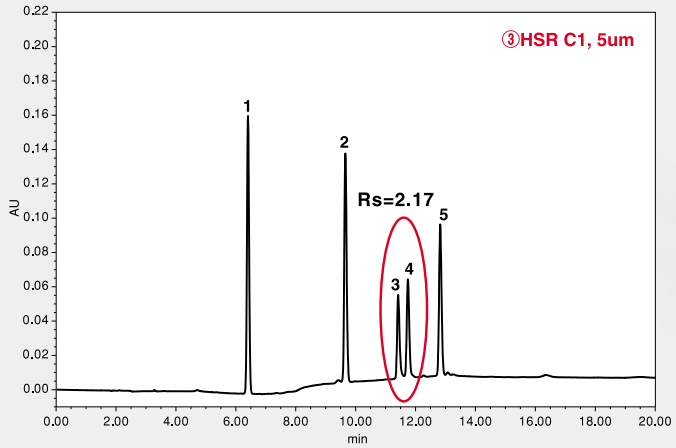
Column	: ①**Develosil HSR C18, 5um (4.6x150mm)** ②**Develosil HSR AQ C18, 5um (4.6x150mm)** ③**Develosil HSR C1, 5um (4.6x150mm)**
Mobile phase	: Methanol/25mM $NH_4H_2PO_4$(pH 2.0)=25/75
Flow rate	: 1.0mL/min
Temperature	: 40℃
Detection	: UV 280nm
Sample	: **1**. (-)-Epigallocatechin (0.25mg/mL) **2**. (-)-Epigallocatechin gallate (0.30mg/mL) **3**. Caffeine **4**. (-)-Epicatechin (0.25mg/mL) **5**. (-)-Epicatechin gallate (0.30mg/mL)
Injection volume	: 2.0uL

Separation comparison using three HSR series. HSR AQ C18 and HSR C1 for highly polar compounds show better separation between caffeine-epicatechin.

[Peptide separation comparison]







Analytical conditions:

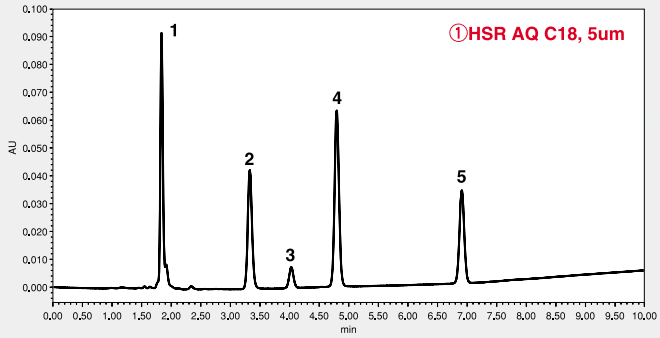
Column	: **①Develosil HSR C18, 5um** **②Develosil HSR AQ C18, 5um** **③Develosil HSR C1, 5um**
Column size	: 4.6x150mm
Mobile phase	: A) 25mM NaCl (pH3.0) B) Acetonitrile
Flow rate	: 1.0mL/min
Temperature	: 40℃
Detection	: UV230nm
Injection volume	: 20.0uL
Sample	: **1.**Gly-Tyr (0.05mg/mL) **2.**Val-Tyr-Val (0.05mg/mL) **3.**Met-Enkephalin (0.05mg/mL) **4.**Angiotensin II (0.05mg/mL) **5.**Leu-Enkephalin

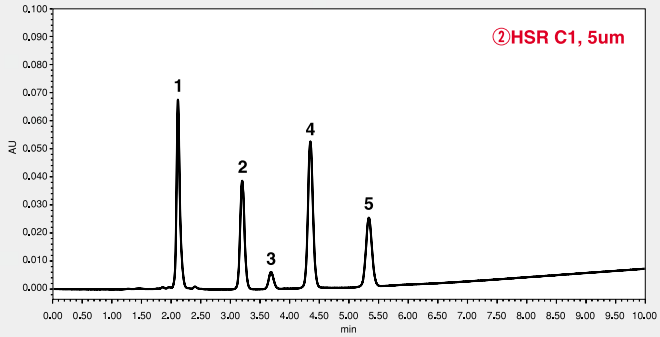
Time (min)	Flow (mL/min)	%A	%B	Curve
0.0	1.0	100	0	5
10.0	1.0	70	30	5
20.0	1.0	70	30	5
20.1	1.0	100	0	5

Comparison of low molecular peptides using three HSR series. HSRC1 shows almost the same retention as ODS and good separation can be obtained in the HSR series even in close peaks such as Met-Enkephalin (3) and Angiotensin II (4). TFA is often added to the mobile phase for analysis of peptides, but it was found that substitution with sodium chloride can also be used when measuring with UV.

※This data is not subjected to chromatographic subtraction processing.

[Analysis of purine derivatives]



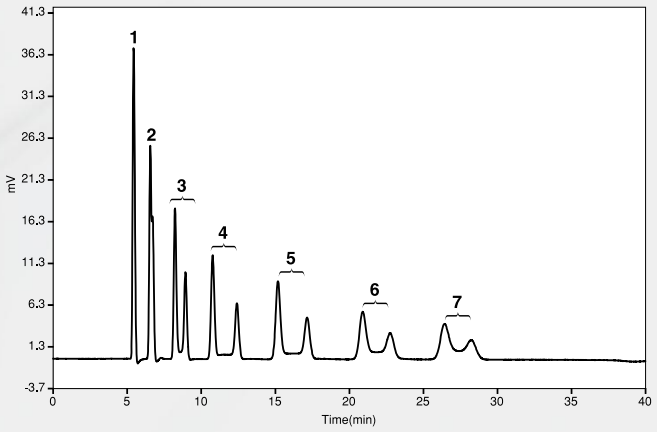


Analytical conditions:

Column	: **①Develosil HSR AQ C18, 5um (4.6x150mm)**
	②Develosil HSR C1, 5um (4.6x150mm)
Mobile phase	: A) 25mM NH4H2PO4 (pH 2.0)
	B) Acetonitrile
Gradient	: B) 2%-10%(0-10min)
Flow rate	: 1.0mL/min
Temperature	: 30℃
Detection	: UV210nm
Sample	: **1.** Allantoin (0.42mg/mL)
	2. Hypoxanthine (0.11mg/mL)
	3. Uric Acid (0.12mg/mL)
	4. Xanthine (0.11mg/mL)
	5. Inosine (0.11mg/mL)
Injection volume	: 1.0uL

※This data is not subjected to chromatographic subtraction processing.

[Analysis of maltooligosaccharide (G1-G7)]



Analytical conditions:

Column	: **Develosil HSR AQ C18, 5um (4.6x250mm)**
Mobile phase	: Water
Flow rate	: 1.0mL/min
Temperature	: 30℃
Detection	: RI
Sample	: **1.** Glucose (1.32mg/mL)
	2. Maltose (1.12mg/mL)
	3. Maltotriose (1.07mg/mL)
	4. Maltotetraose (1.10mg/mL)
	5. Maltohexaose (1.19mg/mL)
	6. Maltopentaose (1.08mg/mL)
	7. Maltoheptaose (1.06mg/mL)
Injection volume	: 10.0uL

NH_2 columns are often used for saccharide analysis, but HSR AQ C18 achieves separation of G1 to G7.

Price list

Develosil HSR AQ C18

Part number	Product name	Partide size (um)	Category	i.d. (mm)	Length (mm)
73-320050W	HSR AQ C18-3	3	Semi-micro	2.0	50
73-320075W				2.0	75
73-320100W				2.0	100
73-320150W				2.0	150
73-320250W				2.0	250
73-520050W	HSR AQ C18-5	5	Semi-micro	2.0	50
73-520075W				2.0	75
73-520100W				2.0	100
73-520150W				2.0	150
73-520250W				2.0	250
73-330050W	HSR AQ C18-3	3	Analysis column（Conventional Column）	3.0	50
73-330075W				3.0	75
73-330100W				3.0	100
73-330150W				3.0	150
73-330250W				3.0	250
73-346050W				4.6	50
73-346075W				4.6	75
73-346100W				4.6	100
73-346150W				4.6	150
73-346250W				4.6	250
73-530050W	HSR AQ C18-5	5	Analysis column（Conventional Column）	3.0	50
73-530075W				3.0	75
73-530100W				3.0	100
73-530150W				3.0	150
73-530250W				3.0	250
73-546050W				4.6	50
73-546075W				4.6	75
73-546100W				4.6	100
73-546150W				4.6	150
73-546250W				4.6	250
73-580250W			Semi-preparative	8.0	250
73-5P1250W				10.0	250
73-5P2250W			Preparative	20.0	250

Develosil HSR AQ C18 Guard column

Part number	Product name	Partide size (um)	Category	i.d. (mm)	Length (mm)
Cartridge type					
HO00015010C	Guard cartridge holder		Holder for the guard cartridge for i.d. 1.0mm,1.5mm and 2.0mm	1.5	10
HO00040010C	Guard cartridge holder		Holder for the guard cartridge for i.d. 4.0mm,4.6mm and 6.0mm	4.0	10
73-515010W	HSR AQ C18-S Guard cartridge set Holder(1piece)+cartridge 10x1.5mm(1piece)	5	The gured column for i.d. 1.0mm,1.5mm and 2.0mm	1.5	10
73-515010C	HSR AQ C18-S Guard cartridge【4/pk】	5	The cartridge for exchange for i.d. 1.0mm,1.5mm and 2.0mm	1.5	10
73-540010W	HSR AQ C18 Guard cartridge set Holder(1piece)+cartridge 10x4.0mm(1piece)	5	The gurad column for i.d. 4.0mm,4.6mm and 6.0mm	4.0	10
73-540010C	HSR AQ C18 Guard cartridge【4/pk】	5	The cartridge for exchange for i.d. 4.0mm,4.6mm and 6.0mm	4.0	10
Filling type					
73-580010W	HSR AQ C18-5	5	The gurad column for i.d. 8.0mm and 10.0mm	8.0	10
73-5P2050W	HSR AQ C18-5	5	The gurad column f or i.d. 20.0mm	20.0	50

Develosil HSR C1

Part number	Product name	Particle size (um)	Category	i.d. (mm)	Length (mm)
74-320050W	HSR C1-3	3	Semi-micro	2.0	50
74-320075W				2.0	75
74-320100W				2.0	100
74-320150W				2.0	150
74-320250W				2.0	250
74-520050W	HSR C1-5	5	Semi-micro	2.0	50
74-520075W				2.0	75
74-520100W				2.0	100
74-520150W				2.0	150
74-520250W				2.0	250
74-330050W	HSR C1-3	3	Analysis column（Conventional Column）	3.0	50
74-330075W				3.0	75
74-330100W				3.0	100
74-330150W				3.0	150
74-330250W				3.0	250
74-346050W				4.6	50
74-346075W				4.6	75
74-346100W				4.6	100
74-346150W				4.6	150
74-346250W				4.6	250
74-530050W	HSR C1-5	5	Analysis column（Conventional Column）	3.0	50
74-530075W				3.0	75
74-530100W				3.0	100
74-530150W				3.0	150
74-530250W				3.0	250
74-546050W				4.6	50
74-546075W				4.6	75
74-546100W				4.6	100
74-546150W				4.6	150
74-546250W				4.6	250
74-580250W			Semi-preparative	8.0	250
74-5P1250W				10.0	250
74-5P2250W			Preparative	20.0	250

Develosil HSR C1 Guard column

Part number	Product name	Particle size (um)	Category	i.d. (mm)	Length (mm)
Cartridge type					
HO00015010C	Guard cartridge holder		Holder for the guard cartridge for i.d. 1.0mm,1.5mm and 2.0mm	1.5	10
HO00040010C	Guard cartridge holder		Holder for the guard cartridge for i.d. 4.0mm,4.6mm and 6.0mm	4.0	10
74-515010W	HSR C1-S Guard cartridge set Holder(1piece)+cartridge 10x1.5mm(1piece)	5	The gured column for i.d. 1.0mm,1.5mm and 2.0mm	1.5	10
74-515010C	HSR C1-S Guard cartridge【4/pk】	5	The cartridge for exchange for i.d. 1.0mm,1.5mm and 2.0mm	1.5	10
74-540010W	HSR C1 Guard cartridge set Holder(1piece)+cartridge 10x4.0mm(1piece)	5	The gurad column for i.d. 4.0mm,4.6mm and 6.0mm	4.0	10
74-540010C	HSR C1 Guard cartridge【4/pk】	5	The cartridge for exchange for i.d. 4.0mm,4.6mm and 6.0mm	4.0	10
Filling type					
74-580010W	HSR C1-5	5	The gurad column for i.d. 8.0mm and 10.0mm	8.0	10
74-5P2050W	HSR C1-5	5	The gurad column f or i.d. 20.0mm	20.0	50

- All Develosil columns have Waters compatible end-fitting.
- It has prepared a variety of column sizes at our company. Column size that is not listed in the price list, please consult.