RStech Corporation

RStech covers various technologies
from synthesis of chiral intermediates
to chiral separation & analysis

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HPLC Column

CHIROSIL

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synthesis of chiral intermediates to chiral separation & analysis

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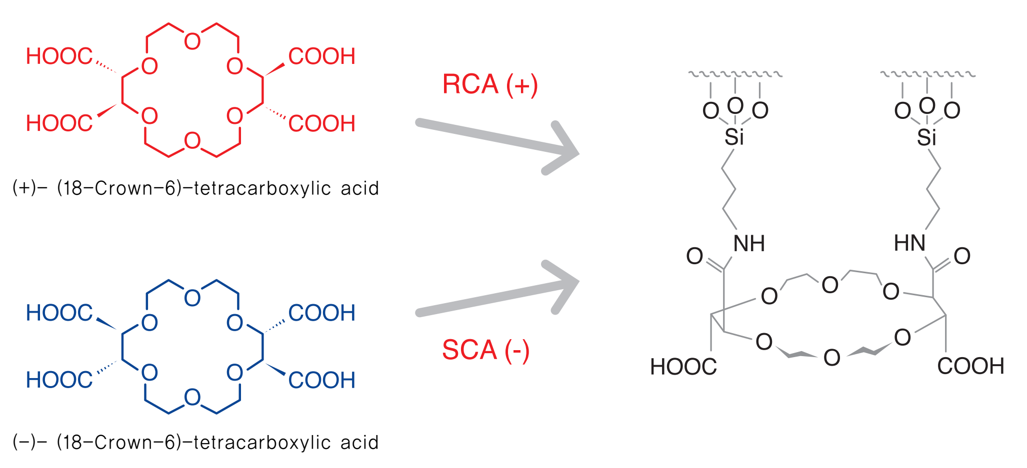
1. Introduction

Application Range

ChiroSil® columns are very effective for enantiomer separation of various natural and unnatural α-amino acids, α-amino acids derivatives, α-amino acids and primary amines.
Other Racemic compounds, such as amino alcohols (β-blockers), secondary amines, drugs containing primary amines and secondary amines are also expected to be resolved on ChiroSil® columns.

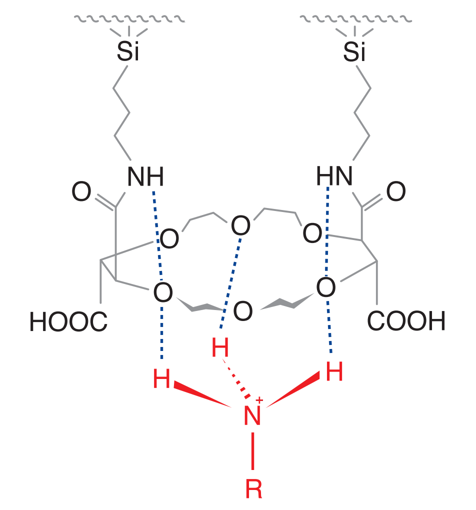
The structure of ChiroSil® Stationary phase

The chiral stationary phase for ChiroSil® RCA(+) and SCA(-) is prepared by a covalent trifunctional bonding of (+) or (-)-(18-Crown-6)-tetracarboxylic acid as the chiral selector to aminopropyl silica gel.



Separation Mechanism

The mechanism of ChiroSil® based on chiral crown ether might originate from two different mechanisms.
One mechanism is the complexation of the primary ammonium group ($R-NH_3^+$) formed by protonation α-amino acids and primary amines under acidic condition inside the cavity of the 18-crown-6 ring of the ChiroSil® CSP.
The other mechanism is the side two carboxylic acid groups of ChiroSil® CSP can act as steric barrier groups or as hydrogen bonding donor or accepter groups.



2. Advantages of ChiroSil®

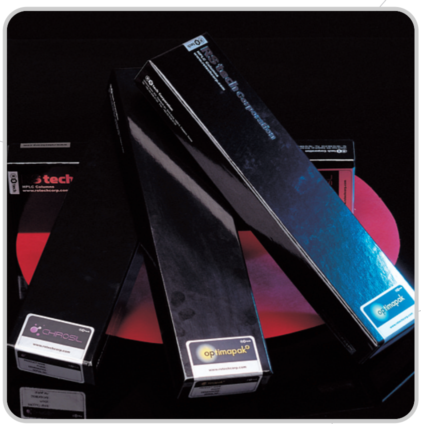
High selectivity:

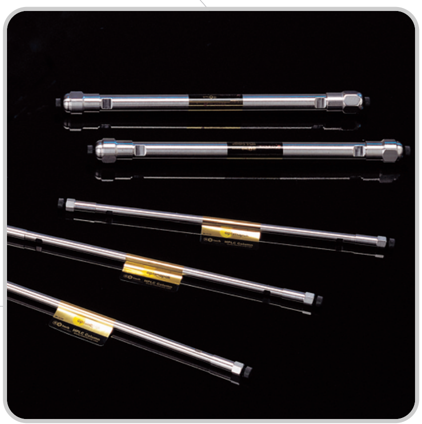
- α-Amino Acids
- α-Amino Amides and Esters
- Amines
- Amino Alcohols
- β-Blockers
- β-Amino Acids
- Aryl α-Amino Ketones
- Tocainide's Analogues
- Gemifloxacin
- *N*-(3, 5-dinitrobenzoyl)-α-Amino Acids
- *N*-(3-dinitrobenzoyl)-α-Amino Acids
- *N*-benzyl-α-Amino Acids

Universal Solvent Capability

Ability to Invert Elution Order

Excellent Column Durability





High selectivity

ChiroSil® column have a high selectivity for enantiomer separation of various natural and unnatural α-amino acids, α-amino acids derivatives, β-amino acids and primary amines.
Other Racemic compounds, such as amino alcohols (β-blockers), secondary amines, drugs containing primary amines and secondary amines are also expected to be resolved on ChiroSil® columns.

Universal Solvent Capability

An important advantage of ChiroSil® over other commercial crown ether-based columns is that it can be used with various mobile phases, without any deterioration in its chiral recognition ability, because the chiral selector of ChiroSil® is bonded to silica gel covalently.
ChiroSil® Chiral Stationary Phases can be used in both normal and reversed-phased solvents.
For example, even 100% methanol can be used as a mobile phase for the resolution of racemic compound on ChiroSil®

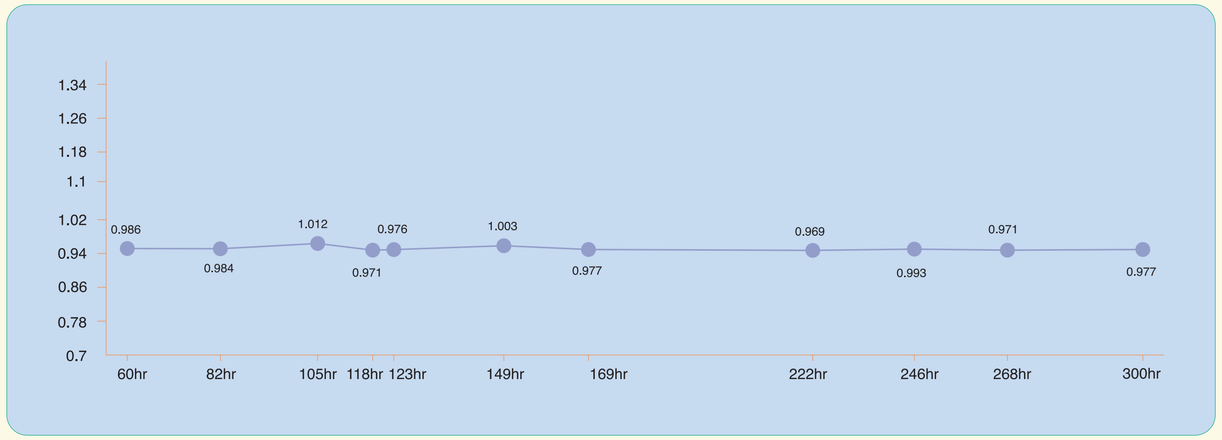
Ability to Invert Elution Order

ChiroSil® has an ability to invert the elution order of enantiomers by switching columns.
In case of Amino acid, most L-enantiomers elute first on the ChiroSil® RCA(+) and D-enantimoers elute first on the ChiroSil® SCA(-) column.

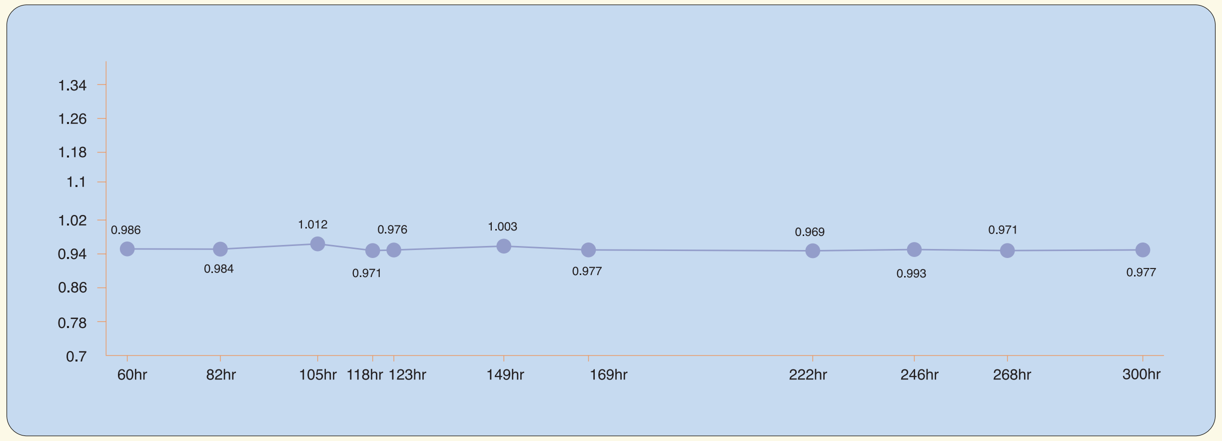
Excellent Column Durability

ChiroSil® stability was tested under highly acidic conditions.
After 300 hours of continuous operation, there was no observable change in α and k'.

<ChiroSil Duration K_1>



<ChiroSil Duration α>



conditions:
Column: ChiroSil RCA 150mm X 4.6mm
Mobile phase: MeOH/H_2O = 84/16 in 0.5ml Perchloric Acid/1000ml, pH 2.09
Flow rate: 1ml/min
Detector: 210nm
Injection: 5호(1-Aminoindan)
Press: 86~83bar

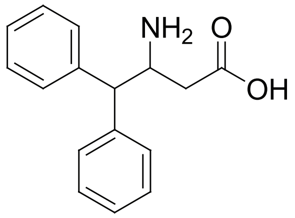
3. Method Development

ChiroSil® should be operated under an aqueous acidic condition for the separation

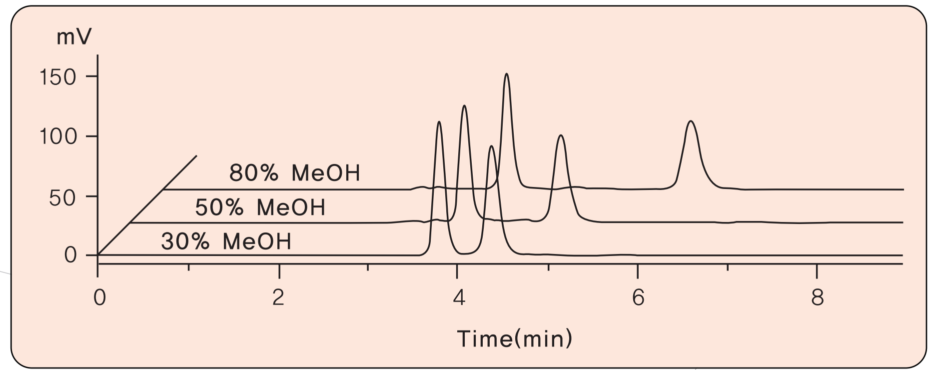
Effect of organic modifier

As the content of organic modifier increases, the aqueous mobile phase becomes less polar and more hydrophobic. In this instance, the hydrophilic interaction between polar-protonated analytes and the mobile phase decreases and consequently, the retention is expected to increase as the content of organic modifier in aqueous mobile phase increases.

The capacity factors (k') generally increase as the content of organic modifier increases and the separation factors (α)and the resolution factors (Rs), in general, increase as the content of organic modifier in the aqueous mobile phase increases.



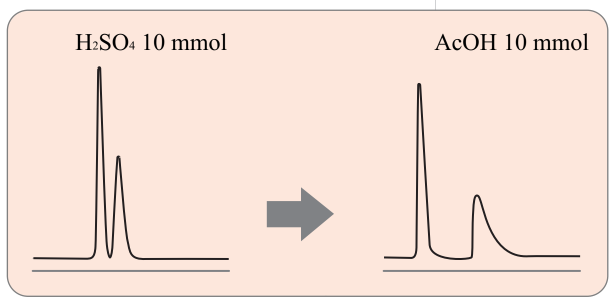
Sample: 3-amino-4, 4-diphenylbutyric acid
Mobile phase: Methanol in H_2O+ sulfuric acid (10mM)
Column: ChiroSil RCA type
Flow rate: 0.5ml/min
Detector: UV 210nm

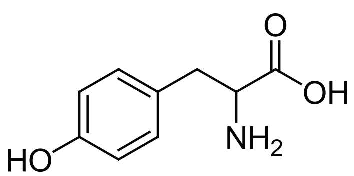


Effect of acidic modifier and acid concentration

*Acidic modifier
Various kinds of acids such as acetic acid, perchloric acid, sulfuric acid, phosphoric acid and trifluoroacetic acid can be used in ChiroSil®

As the enatioselectivity of each acid is different so it is recommended that you find the proper acid for getting a good resolution by the trial and error method.

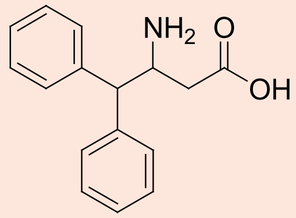




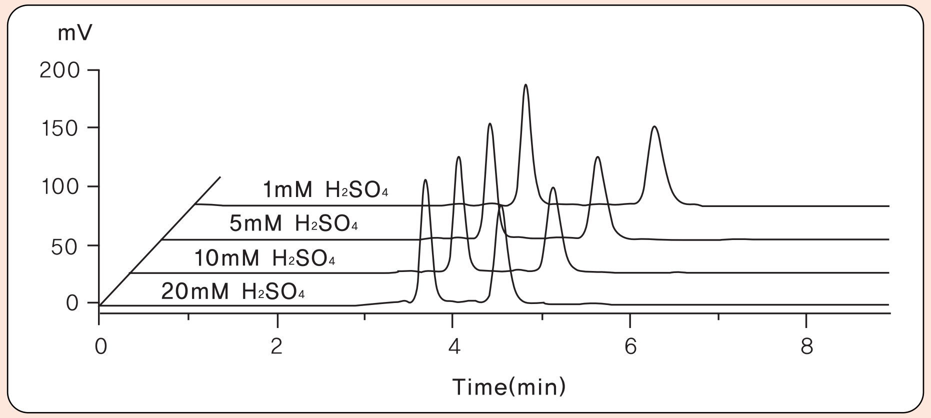
Sample: Tyrosine
Column : ChiroSil SCA(-) 150x4.6mm
Flow rate: 1.0ml/min
Detector : UV 210nm

*Acid Concentration
As the content of acidic modifier in aqueous mobile phase increases, the ionic strength of mobile phase increases and consequently, the hydration or the dissolution of polar-protonated analytes by mobile phase is expected to increase. In this instance, polar-protonated analytes are eluted faster and faster as the content of acidic modifier increases.

Generally the capacity factors (k') decease as the concentration of acidic modifier in the mobile phase increases but we recommend trying an analysis for new analytes under low acid concentration because higher acid concentration is not always performing better resolutions.

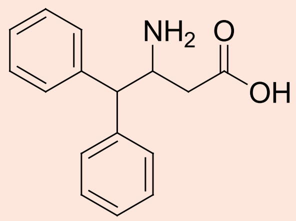


Sample: 3-amino-4, 4-diphenylbutyric acid
Mobile phase: 50% Methanol in H_2O+ sulfuric acid (10mM)
Column: ChiroSil RCA type
Flow rate: 0.5ml/min
Detector: UV 210nm

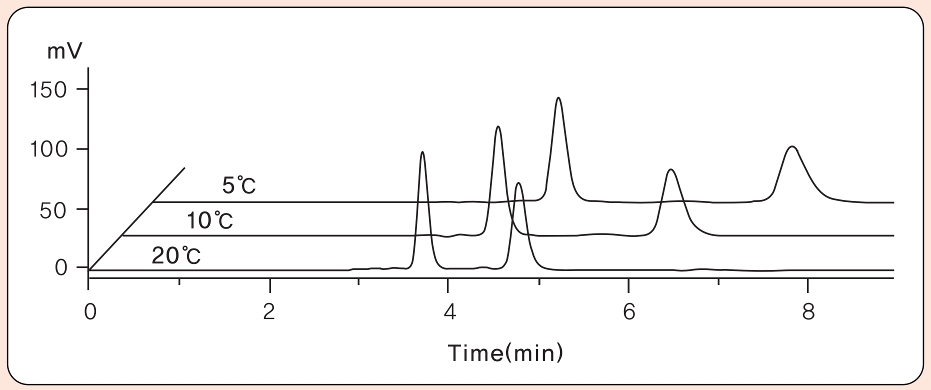


Effect of temperature

At lower temperature, the formation of the two diastereomeric complexes formed by the two enantiomers of racemic compounds inside the cavity of the crown ether ring of CSP is expected to be much more favorable than that of the less stable diastereomeric complex. The difference in the stability of the two diastereomeric complexes increases as the temperature of the column is lowered.
The capacity factors (k'), the separation factors (α) and the resolution factors (Rs) are improved as the temperature is lowered.



Sample: 3-amino-4, 4-diphenylbutyric acid
Mobile phase: 50% Methanol in H_2O+ sulfuric acid (10mM)
Column: ChiroSil RCA type
Flow rate: 0.5ml/min
Detector: UV 210nm



4. General Operating Conditions

Storage

ChiroSil® columns are shipped in methanol only.

Temperature

The temperature that can be safely employed is from -5℃ to 50℃ in all solvent modes.
In many cases, lower temperature shows better resolution of analytes

pH range

ChiroSil® can be used in the pH range 1.5 ~ 7.5

Pressure

Operating pressure for ChiroSil® Columns is generally in range of 1000 psi to 5000 psi

Cleaning of the column

After using ChiroSil® under acidic conditions, never store with acidic components.
When analysis is complete, wash the column with 20ml of distilled water - first at a flow-rate of 1ml/min then gradually increasing the amount of methanol.
Finally, wash it with 20ml of methanol at a flow-rate of 1ml/min.
ChiroSil® is recommended to be filled with methanol 100% after washing.

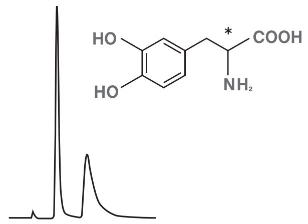
Equilibution Time

ChiroSil needs enough equilibration time to develop stable retention factors. (See the below table)
During mobile phase equilibration, enantioselective separations are obtained for all analytes, but retention factors are slowly decreased until stable retention factors are obtained.

Acidic Modifier change		Equilibration time	Flow rate	Temperature
Before Condition	After Condition			
100% MeOH (Virgin Column)	84%MeOH in H_2O + Perchloric acid ($HClO_4$) 5mM	7 hr	1ml	20℃
	84%MeOH in H_2O + Sulfuric acid (H_2SO_4) 10mM			
84%MeOH in H_2O + Sulfuric acid (H_2SO_4) 10mM	84%MeOH in H_2O + Acetic acid (AcOH) 10mM	3hr	1ml	20℃
84%MeOH in H_2O + Acetic acid (AcOH) 10mM	84%MeOH in H_2O + Perchloric acid ($HClO_4$) 5mM	2hr	1ml	20℃
84%MeOH in H_2O + Perchloric acid ($HClO_4$) 5mM	84%MeOH in H_2O + Sulfuric acid (H_2SO_4) 10mM	2hr	1ml	20℃

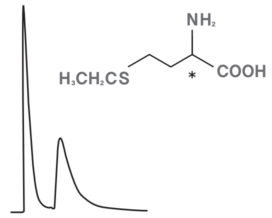
α-Amino Acids

DOPA



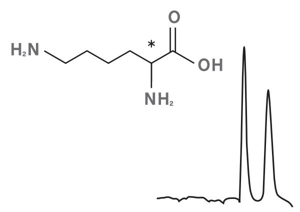
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (70/30) CH_3OH/H_2O + 0.01% Phosphoric acid
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 5.5 min
k_1 : 0.97 α : 2.30

Ethionine



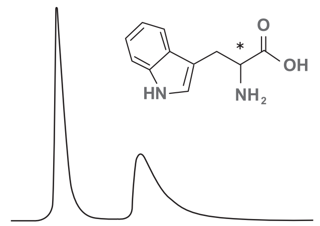
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (75/25) CH_3OH/H_2O + 0.02% Acetic acid
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 6.2 min
k_1 : 1.29 α : 2.07

Lysine



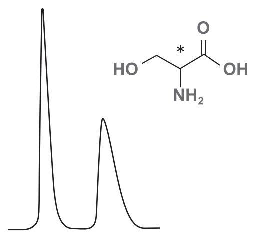
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (70/30) CH_3OH/H_2O + 0.01% Phosphoric acid
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 5.3 min
k_1 : 1.44 α : 1.48

Tryptophan



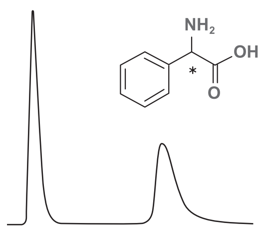
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (70/30) CH_3OH/H_2O + 10mM Acetic acid
Flow Rate : 1.5 ml/min
Detection : UV 210nm
Run time : 11.0 min
k_1 : 4.06 α : 2.15

Serine



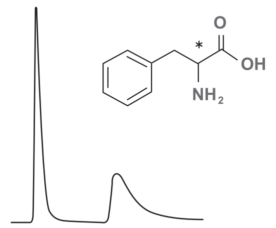
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (84/16) CH_3OH/H_2O + 5mM $HClO_4$
Flow Rate : 0.8 ml/min
Detection : UV 210nm
Run time : 6.0 min
k_1 : 1.37 α : 1.99

Phenylglycine



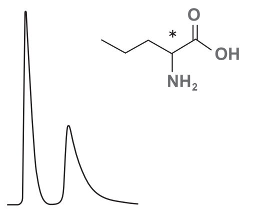
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (70/30) CH_3OH/H_2O + 10mM H_2SO_4 and 0.1% TEA
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 13.1 min
k_1 : 3.14 α : 2.60

Phenylalaine



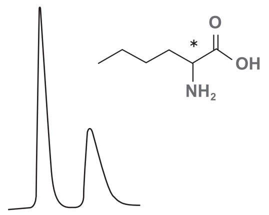
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (70/30) CH_3OH/H_2O + 10mM Acetic acid
Flow Rate : 1.5 ml/min
Detection : UV 210nm
Run time : 8.9 min
k_1 : 2.66 α : 2.57

Norvaline



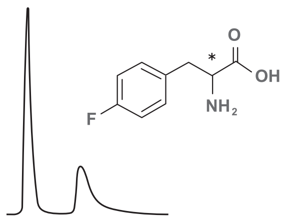
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (45/55) CH_3OH/H_2O + 10mM Acetic acid
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 5.3 min
k_1 : 1.15 α : 1.79

Norleucine



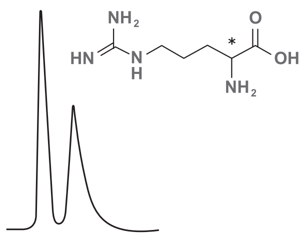
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (45/55) CH_3OH/H_2O + 10mM Acetic acid
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 5.6 min
k_1 : 1.28 α : 1.75

4-Fluorophenylalaine



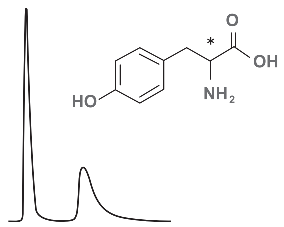
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (70/30) CH_3OH/H_2O + 10mM Acetic acid
Flow Rate : 1.5 ml/min
Detection : UV 210nm
Run time : 9.6 min
k_1 : 2.92 α : 2.56

Arginine



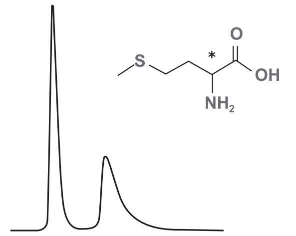
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (84/16) CH_3OH/H_2O + 10mM H_2SO_4
Flow Rate : 0.8 ml/min
Detection : UV 210nm
Run time : 4.9 min
k_1 : 1.21 α : 1.64

Tyrosine



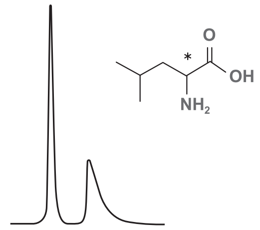
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (70/30) CH_3OH/H_2O + 10mM Acetic acid
Flow Rate : 1.5 ml/min
Detection : UV 210nm
Run time : 9.1 min
k_1 : 2.95 α : 2.38

Methionine



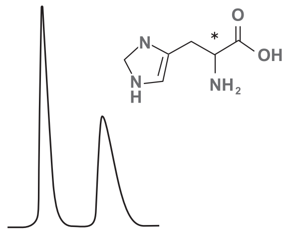
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (45/55) CH_3OH/H_2O + 10mM Acetic acid
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 7.5 min
k_1 : 1.64 α : 2.04

Leucine



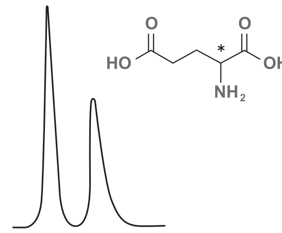
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (45/55) CH_3OH/H_2O + 10mM Acetic acid
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 5.5 min
k_1 : 1.03 α : 2.14

Histidine



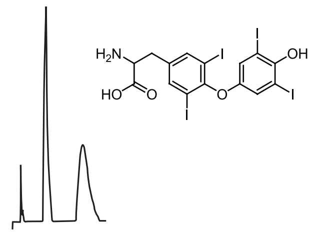
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (45/55) CH_3OH/H_2O + 10mM Acetic acid
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 26.0 min
k_1 : 10.96 α : 1.27

Glutamic Acid

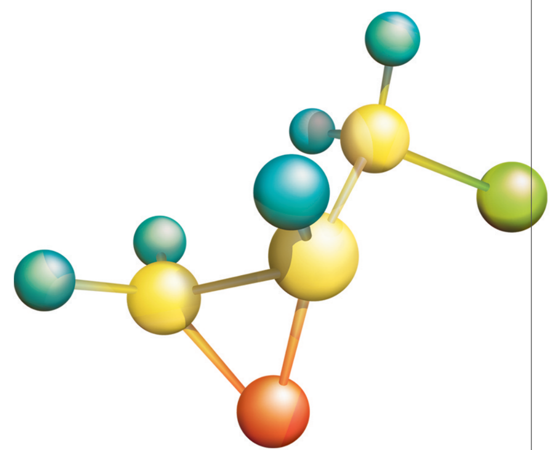


Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (65/35) CH_3OH/H_2O + 0.05% Phosphoric acid
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 4.5 min
k_1 : 0.71 α : 2.27

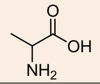
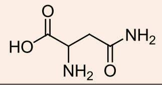
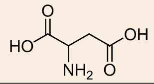
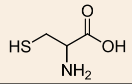
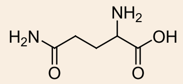
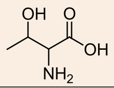
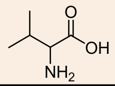
Thyroxine[8]



Column: ChiroSil Type
Mobile phase: 80 % methanol in water + sulfuric acid (5 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20℃

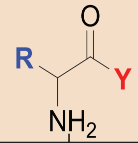


Other α-Amino Acids[1]

α-Amino Acids	Structure	k_1	α	R_S
Alanine		1.37	1.28	1.33
Asparagine		1.31	1.10	0.63
Aspartic acid		1.51	1.22	1.25
Cysteine		1.32	1.10	0.30
Glutamine		1.31	1.32	1.72
Threonine		0.24	1.42	1.30
Valine		0.40	1.31	1.14

Condition
Column: ChiroSil Type
Mobile phase: 80% Methanol in H_2O+ sulfuric acid (10mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20 ℃

α-Amino amides and esters[1]

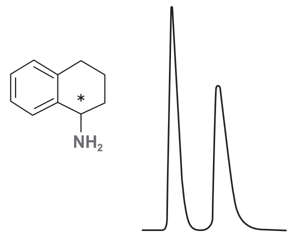


R	Y	k_1	α	R_S
CH_3	$NH(CH_2)_3CH_3$	1.60	1.41	2.34
	$NHC(CH_3)_3$	1.39	1.42	2.32
	$NHCH_2C_6H_5$	2.58	1.38	2.33
	OCH_3	1.36	1.10	0.48
$CH(CH_3)_2$	$NH(CH_2)_3CH_3$	0.28	1.64	1.32
	$NHC(CH_3)_3$	0.25	1.59	1.11
	$NHCH_2C_6H_5$	0.46	1.48	1.50
	OCH_2CH_3	0.39	1.33	0.80
$CH_2CH(CH_3)_2$	$NH(CH_2)_2CH_3$	1.07	2.48	8.15
	$NH(CH_2)_3CH_3$	1.03	2.71	8.30
	$N(CH_2CH_3)_2$	0.42	1.24	0.94
$CH_2C_6H_5$	$NH(CH_2)_2CH_3$	1.94	2.45	6.99
	$NHC(CH_3)_3$	2.06	2.28	7.36
C_6H_5	$NH(CH_2)_2CH_3$	1.55	2.46	7.27
	$NHC(CH_3)_3$	1.28	2.67	6.32
	$N(CH_2CH_3)_2$	1.40	3.15	9.77
	OCH_3	2.10	2.09	6.85
4-CH_3O-C_6H_5	$NHCH_3$	1.73	2.39	8.63
	$NH(CH_2)_2CH_3$	1.59	2.43	7.27
	$NHC(CH_3)_3$	1.35	2.62	7.47

Condition
Column: ChiroSil Type
Mobile phase: 80% Methanol in H_2O+ sulfuric acid (10mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20 ℃

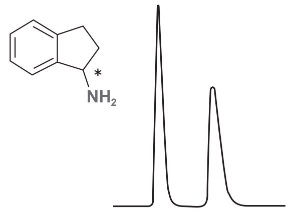
Amines[2] [10]

1,2,3,4-Tetrahydro-1-naphthylamine

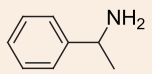
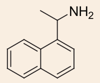
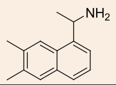
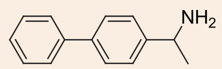
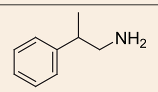
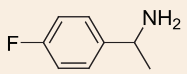
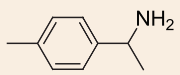
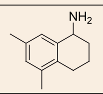
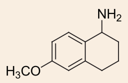


Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (84/16) CH_3OH/H_2O + 10mM H_2SO_4 and 0.1% TEA
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 3.5 min
k_1 : 0.82 α : 1.76

1-Aminoindan



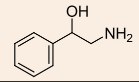
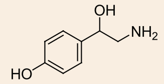
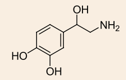
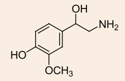
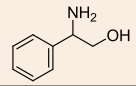
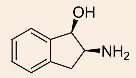
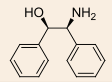
Column : ChiroSil RCA(+) or SCA(−)
15cm × 4.6mm
Mobile Phase : (84/16) CH_3OH/H_2O + 10mM $HClO_4$ and 0.1% TEA
Flow Rate : 1.0 ml/min
Detection : UV 210nm
Run time : 4.8 min
k_1 : 1.44 α : 1.91

Amines	k_1	α	R_S	Condition
	2.45	1.10	0.80	A
	1.90	1.28	2.57	A
	1.38	1.84	5.23	A
	2.86	1.11	1.05	A
	1.40	1.11	1.02	A
	0.42	1.22	0.82	B
	0.41	1.11	0.38	B
	0.51	1.39	1.69	A
	5.21	3.46	12.00	A

Condition A
Column: ChiroSil Type
Mobile phase: 80% Methanol in H_2O+ sulfuric acid (10mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20 ℃

Condition B
Column: ChiroSil Type
Mobile phase: 50% Methanol in H_2O+ sulfuric acid (10mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20 ℃

Amino Alcohols[2] [10]

Amino Alcohols	Structure	k_1	α	R_S	Condition
2-amino-1-phenylethanol		1.10	1.40	1.52	B
4-(2-amino-1-hydroxyethyl)phenol		0.92	1.19	1.41	B
4-(2 amino-1-hydroxyethyl)benzene-1,2-diol		0.90	1.15	1.00	B
4-(2-amino-1-hydroxyethyl)-2-methoxyphenol		1.25	1.18	1.23	B
2-amino-2-phenylethanol		1.44 (S)	1.35	2.18	A
2-amino-2,3-dihydro-1H-inden-1-ol		1.98 (1R, 2S)	1.78	0.80	A
2-amino-1,2-diphenylethanol		0.29 (1S, 2R)	1.53	1.48	C

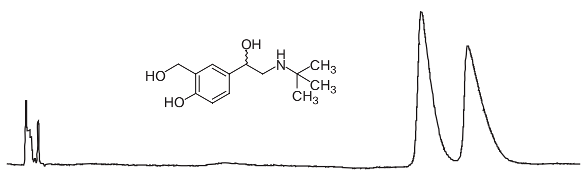
Condition A
Column: ChiroSil Type
Mobile phase: 100% H_2O+ sulfuric acid (10mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20 ℃

Condition B
Column: ChiroSil Type
Mobile phase: 80% Methanol in H_2O+ sulfuric acid (10mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20 ℃

Condition C
Column: ChiroSil Type
Mobile phase: 50% Methanol in H_2O+ sulfuric acid (10mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20 ℃

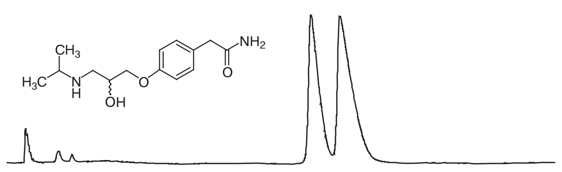
β-Blockers[9]

Albuterol



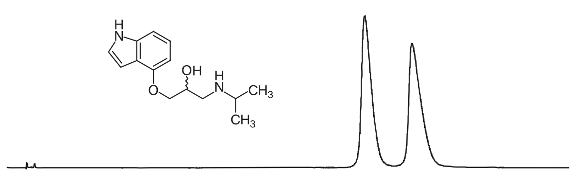
Column: ChiroSil Type
Mobile phase: 0.1 / 0.1 /50/50 acetic acid–triethylamine–methanol–acetonitrile (v/v/v/v)
Flow rate: 1 ml/min
Detection: 260 nm UV
Temperature: 20℃
k_1 : 21.34 α : 1.2

Atenolol



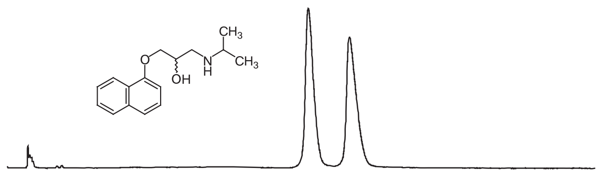
Column: ChiroSil Type
Mobile phase: 0.1 / 0.1 /50/50 acetic acid–triethylamine–methanol–acetonitrile (v/v/v/v)
Flow rate: 1 ml/min
Detection: 260 nm UV
Temperature: 20℃
k_1 : 15.86 α : 1.10

Pindolol



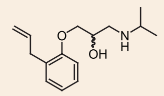
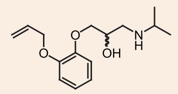
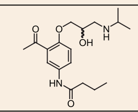
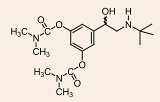
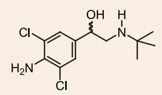
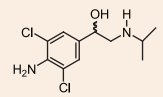
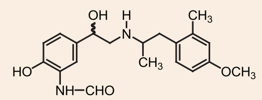
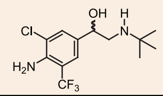
Column: ChiroSil Type
Mobile phase: 0.1 / 0.1 /50/50 acetic acid–triethylamine–methanol–acetonitrile (v/v/v/v)
Flow rate: 1 ml/min
Detection: 260 nm UV
Temperature: 20℃
k_1 : 18.99 α : 1.14

Propranolol



Column: ChiroSil Type
Mobile phase: 0.1 / 0.1 /50/50 acetic acid–triethylamine–methanol–acetonitrile (v/v/v/v)
Flow rate: 1 ml/min
Detection: 260 nm UV
Temperature: 20℃
k_1 : 15.16 α : 1.15

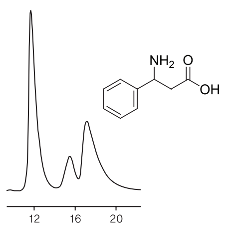
Other β-Blockers[19]

β-Blockers	Structure	k_1	α	R_S
Alprenolol		29.35	1.26	2.12
Oxprenolol		24.61	1.22	2.29
Acebutolol		45.60	1.29	2.90
Bambuterol		22.52	1.85	4.21
Clenbuterol		53.61	1.59	4.37
Clenpropol		48.61	1.13	1.58
Fumoterol		98.08	1.23	1.36
Mabuterol		43.07	1.64	5.79

Condition
Column: ChiroSil Type
Mobile phase: 0.1 / 0.5 /20/80 trifluoroacetic acid-triethylamine-ethanol-acetonitrile (v/v/v/v)
Flow rate: 1 ml/min
Detection: 260 nm UV
Temperature: 20 ℃

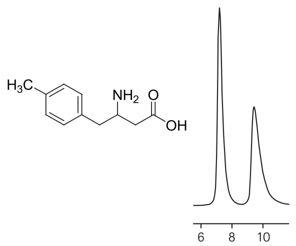
β-Amino Acids[6]

3-amino-3-phenylpropanoic acid



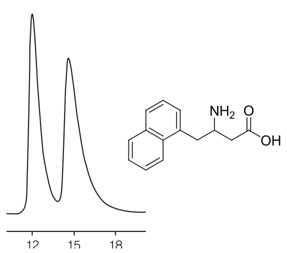
Column: ChiroSil Type
Mobile phase: 50 % methanol in water + acetic acid(10 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20℃
k_1 : 3.60 α : 102

3-amino-4-(4-methylphenyl)butanoic acid



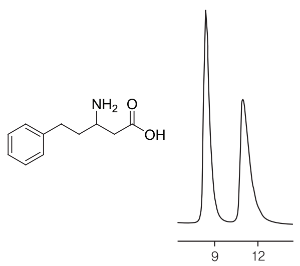
Column: ChiroSil Type
Mobile phase: 50 % methanol in water + acetic acid(10 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20℃
k_1 : 1.26 α : 1.40

3-amino-4-(1-naphthyl)butanoic acid



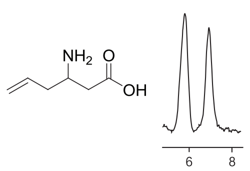
Column: ChiroSil Type
Mobile phase: 50 % methanol in water + acetic acid(10 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20℃
k_1 : 3.72 α : 1.28

3-amino-5-phenylpentanoic acid



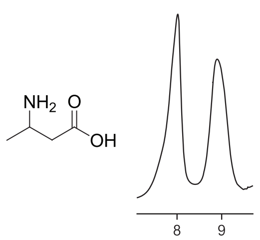
Column: ChiroSil Type
Mobile phase: 50 % methanol in water + acetic acid(10 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20℃
k_1 : 2.30 α : 1.44

3-amino-5-hexenoic acid



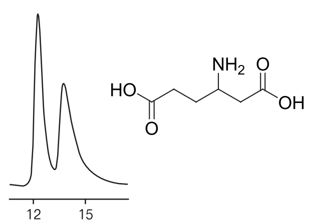
Column: ChiroSil Type
Mobile phase: 50 % methanol in water + acetic acid(10 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20℃
k_1 : 1.02 α : 1.37

3-aminobutyric acid



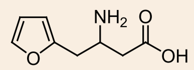
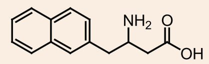
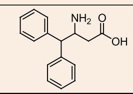
Column: ChiroSil Type
Mobile phase: 50 % methanol in water + acetic acid(10 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20℃
k_1 : 2.16 α : 1.16

3-aminoadipic acid



Column: ChiroSil Type
Mobile phase: 50 % methanol in water + acetic acid(10 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20℃
k_1 : 3.83 α : 1.16

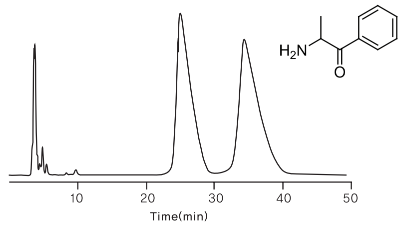
Other β-Amino Acids[11]

β-Blockers	Structure	k_1	α	R_S
3-amino-4-(2-furyl)butyric acid		1.33	1.33	1.66
3-amino-4-(2-naphthyl)butyric acid		2.38	1.53	2.07
3-amino-4,4-diphenylbutyric acid		0.67	1.34	1.38

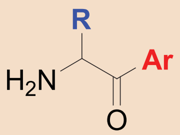
Condition
Column: ChiroSil Type
Mobile phase: 50 % methanol in water + acetic acid (10 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20 ℃

Aryl α-Amino Ketones[15]

Cathinone



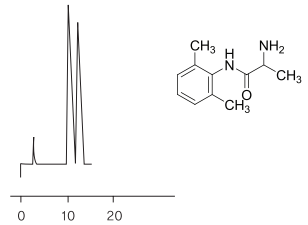
Column: ChiroSil Type
Mobile phase: 50 % methanol in water + acetic acid(10 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20℃
k_1 : 3.83 α : 1.16

		k_1	α	R_S
Ar	R			
C_6H_5	$CH(CH_3)_2$	0.11	2.12	2.13
C_6H_5	$CH_2CH(CH_3)_2$	0.34	1.95	3.11
C_6H_5	$CH_2CH_2SCH_3$	0.84	1.57	2.29
C_6H_5	$CH_2C_6H_5$	1.03	1.55	3.55
4-$CH_3C_6H_4$	CH_3	1.22	1.55	2.80
4-$CH_3C_6H_4$	$CH(CH_3)_2$	0.16	2.08	1.89
4-$CH_3C_6H_4$	$CH_2CH(CH_3)_2$	0.31	1.99	2.88
4-$CH_3C_6H_4$	$CH_2CH_2SCH_3$	0.78	1.65	2.98
4-$CH_3C_6H_4$	$CH_2C_6H_5$	0.86	1.58	3.09
1-Naphthyl	$CH(CH_3)_2$	0.25	2.20	3.87
2-Naphthyl	$CH(CH_3)_2$	0.26	2.19	3.77

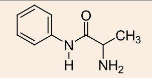
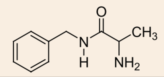
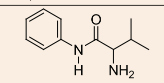
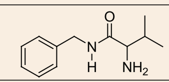
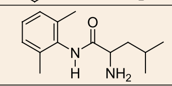
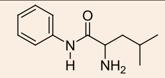
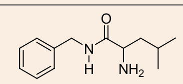
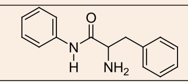
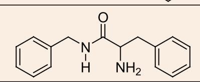
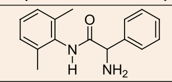
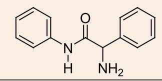
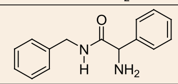
Condition
Column: ChiroSil Type
Mobile phase: 80 % ethanol in water + Sulfuric acid (10 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20 ℃

Tocainide's Analogues

Tocainide



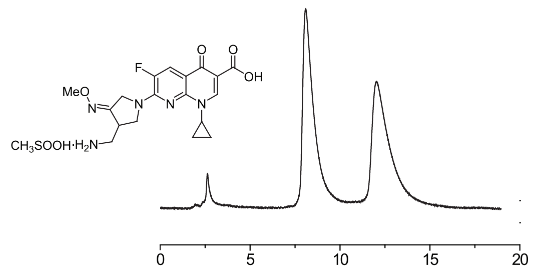
Column: ChiroSil Type
Mobile phase: 80 % methanol in water + sulfuric acid (5 mM)
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20℃

Tocainide's Analogue	Structure	k_1	α	R_S
2-amino-N-phenylpropanamide		1.82	1.73	2.52
2-amino-N-benzylpropanamide		1.38	1.44	2.10
2-amino-3-methyl-N-phenylbutanamide		0.34	2.10	2.56
2-amino-N-benzyl-3-methylbutanamide		0.30	1.42	1.00
2-amino-4-methyl-N-(2,6-dimethylphenyl)pentanamide		0.25	1.17	0.25
2-amino-4-methyl-N-phenylpentanamide		1.35	5.00	4.00
2-amino-N-benzyl-4-methylpentanamide		1.07	2.39	5.50
2-amino-N,3-diphenylpropanamide		2.29	3.72	5.33
2-amino-N-benzyl-3-phenylpropanamide		2.08	2.19	3.29
2-amino-N-(2,6-dimethylphenyl)-2-phenylacetamide		1.49	2.05	3.52
2-amino-N,2-diphenylacetamide		1.55	3.50	5.50
2-amino-N-benzyl-2-phenylacetamide		1.60	2.58	4.89

Condition
Column: ChiroSil Type
Mobile phase: 80 % methanol in water + sulfuric acid (10 mM).
Flow rate: 0.5 ml/min
Detection: 210 nm UV
Temperature: 20 ℃

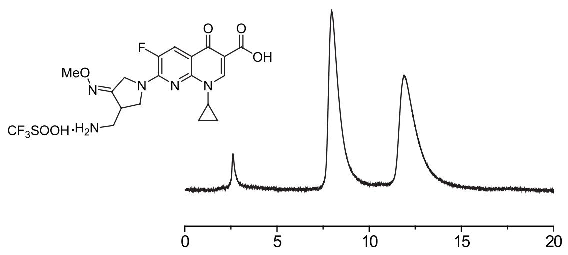
Gemifloxacin[7]

Gemifloxacin mesylate



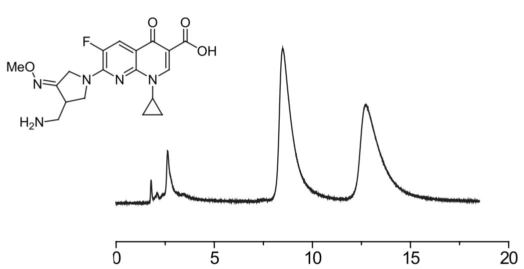
Column: ChiroSil Type
Mobile phase: 80 % methanol in water + perchloric acid (10 mM)
Flow rate: 0.5 ml/min
Detection: 254 nm UV
Temperature: 20℃
k_1 : 3.55 α : 1.62

Gemifloxacin triflate



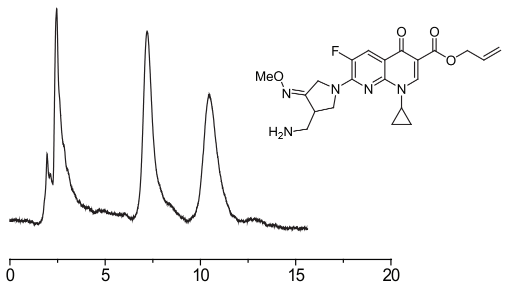
Column: ChiroSil Type
Mobile phase: 80 % methanol in water + perchloric acid (10 mM)
Flow rate: 0.5 ml/min
Detection: 254 nm UV
Temperature: 20℃
k_1 : 3.49 α : 1.63

Free form of Gemifloxacin



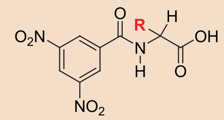
Column: ChiroSil Type
Mobile phase: 80 % methanol in water + perchloric acid (10 mM)
Flow rate: 0.5 ml/min
Detection: 254 nm UV
Temperature: 20℃
k_1 : 3.78 α : 1.63

Allyl ester of Gemifloxacin



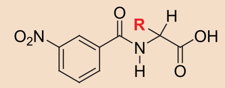
Column: ChiroSil Type
Mobile phase: 80 % methanol in water + perchloric acid (10 mM)
Flow rate: 0.5 ml/min
Detection: 254 nm UV
Temperature: 20℃
k_1 : 3.05 α : 1.60

N-(3, 5-dinitrobenzoyl)-α-Amino Acid[18]

 R	k_1	α	R_S
CH_3	6.81	1.20	0.76
$(CH_3)_2CH$	3.22	1.81	2.81
$(CH_3)_2CHCH_2$	4.56	1.57	2.01
C_6H_5	3.56	1.47	1.49
$C_6H_5CH_2$	5.11	1.61	1.78
$HOCH_2$	21.25	1.06	0.54
$CH_3(OH)CH$	8.85	1.23	0.74
4-OH-$C_6H_4CH_2$	36.20	1.27	0.73

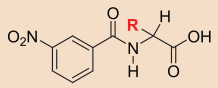
Condition
Column: ChiroSil Type
Mobile phase: 0.05 / 0.25 /100 acetic acid-triethylamine-ethanol-acetonitrile (v/v/v)
Flow rate: 0.5 ml/min
Detection: 254 nm UV
Temperature: 20 ℃

N-(3-dinitrobenzoyl)-α-Amino Acids[18]

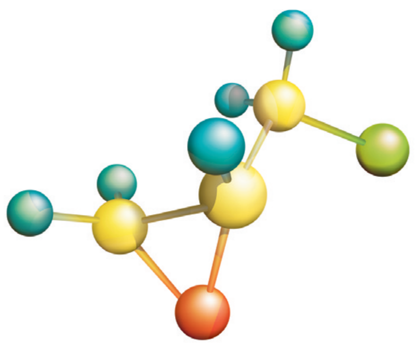
 R	k_1	α	R_S
CH_3	5.71	1.14	0.60
$(CH_3)_2CH$	3.06	1.46	1.40
$(CH_3)_2CHCH_2$	4.26	1.45	1.68
C_6H_5	2.86	1.25	0.97

Condition
Column: ChiroSil Type
Mobile phase: 0.05 / 0.25 /100 acetic acid-triethylamine-ethanol-acetonitrile (v/v/v)
Flow rate: 0.5 ml/min
Detection: 254 nm UV
Temperature: 20 ℃

N-benzyl-α-Amino Acids[18]

 R	k_1	α	R_S
$(CH_3)_2CH$	3.35	1.11	0.41
$(CH_3)_2CHCH_2$	3.68	1.14	0.55

Condition
Column: ChiroSil Type
Mobile phase: 0.05 / 0.25 /100 acetic acid-triethylamine-ethanol-acetonitrile (v/v/v)
Flow rate: 0.5 ml/min
Detection: 254 nm UV
Temperature: 20 ℃



RStech covers various technologies from synthesis of chiral intermediates to chiral separation & analysis

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7. Product list

Product Name	CSPs, Particle size	dimension
CH RCA(+)-51001021	Chirosil RCA(+), 5micron, 100	100mm x 2.1mm
CH RCA(+)-51001521	Chirosil RCA(+), 5micron, 100	150mm x 2.1mm
CH RCA(+)-51001546	Chirosil RCA(+), 5micron, 100	150mm x 4.6mm
CH RCA(+)-51002546	Chirosil RCA(+), 5micron, 100	250mm x 4.6mm
CH RCA(+)-51002510	Chirosil RCA(+), 5micron, 100	250mm x 10.0mm
CH RCA(+)-51002520	Chirosil RCA(+), 5micron, 100	250mm x 21.1mm
CH RCA(+)-101001546	Chirosil RCA(+), 10micron, 100	150mm x 4.6mm
CH RCA(+)-101002546	Chirosil RCA(+), 10micron, 100	250mm x 4.6mm
CH RCA(+)-101002510	Chirosil RCA(+), 10micron, 100	250mm x 10.0mm
CH RCA(+)-101002520	Chirosil RCA(+), 10micron, 100	250mm x 21.1mm
CH SCA(-)-51001021	Chirosil SCA(-), 5micron, 100	100mm x 2.1mm
CH SCA(-)-51001521	Chirosil SCA(-), 5micron, 100	150mm x 2.1mm
CH SCA(-)-51001546	Chirosil SCA(-), 5micron, 100	150mm x 4.6mm
CH SCA(-)-51002546	Chirosil SCA(-), 5micron, 100	250mm x 4.6mm
CH SCA(-)-51002510	Chirosil SCA(-), 5micron, 100	250mm x 10.0mm
CH SCA(-)-51002520	Chirosil SCA(-), 5micron, 100	250mm x 21.1mm
CH SCA(-)-101001546	Chirosil SCA(-), 10micron, 100	150mm x 4.6mm
CH SCA(-)-101002546	Chirosil SCA(-), 10micron, 100	250mm x 4.6mm
CH SCA(-)-101002510	Chirosil SCA(-), 10micron, 100	250mm x 10.0mm
CH SCA(-)-101002520	Chirosil SCA(-), 10micron, 100	250mm x 21.1mm
CH RCA(+)-Guard	Chirosil RCA(+), 5micron, 100	10.0mm x 4.0mm
CH SCA(-)-Guard	Chirosil SCA(-), 5micron, 100	10.0mm x 4.0mm

*Guard holder