Nagase's Library of Unnatural Amino Acids

Aug. 2010 Ver.14

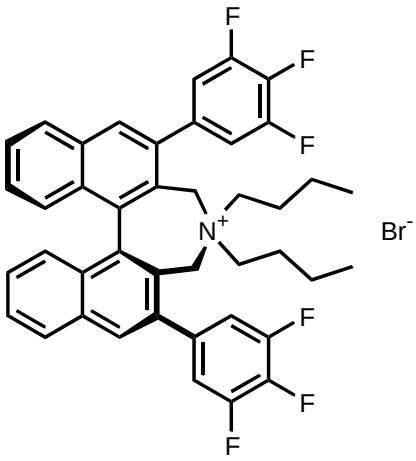
Nagase's Maruoka asymmetric alkylation technology provides unique α-mono substituted and α, α- disubstituted unnatural amino acids

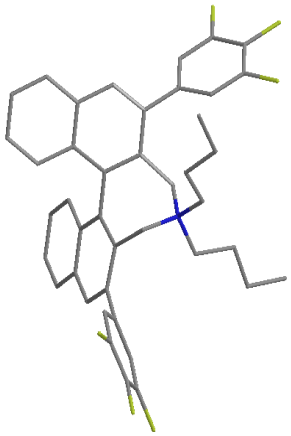
which should open new avenues for designing drug candidates and streamlining the production of drugs in the pipeline.

which can be supplied in multi-kg and more quantities via stereoselective double alkylation of glycine derivatives using asymmetric phase-transfer catalysts 'Maruoka Catalyst®' invented by Prof. Keiji Maruoka at Kyoto University in JAPAN.

which contain no metal so should be safe for API production and should be environmentally friendly.

Maruoka Catalyst®



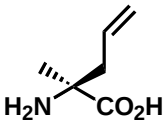


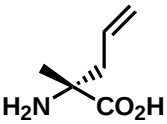
Maruoka Catalyst is the registered trademark of Nagase in JAPAN, US and UK.

Contents:

Reactive Amino Acids (α-Alkenyl or α-Alkynyl Glycines and Alanines)

α-AlkenylAla



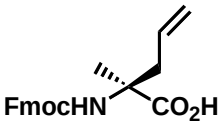


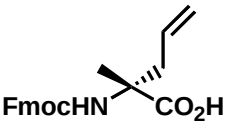
335438 **(*S*)-α-Allylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[CAS No.96886-55-4] $C_6H_{11}NO_2 \cdot H_2O$=147.17

335437 **(*R*)-α-Allylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[CAS No.96886-56-5] $C_6H_{11}NO_2 \cdot H_2O$=147.17





358028 **(S)-N-Fmoc-α-Allylalanine** (≥ 98.0%, ≥ 98.0%ee) (refrigerated transport)

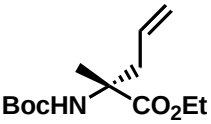
[CAS No.288617-71-0] $C_{21}H_{21}NO_4$=351.40 1g (NET) $ 760

containing 20-50% Methyl *tert*-Bu ether

358027 **(R)-N-Fmoc-α-Allylalanine** (≥ 98.0%, ≥ 98.0%ee) (refrigerated transport)

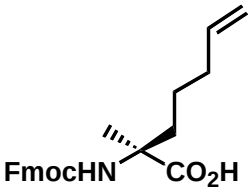
[CAS No.288617-76-5] $C_{21}H_{21}NO_4$=351.40 1g (NET) $ 760

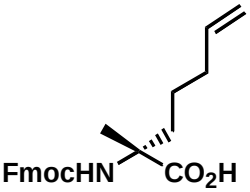
containing 20-50% Methyl *tert*-Bu ether



354283 **(*R*)-N-Boc-α-Allylalanine Ethyl ester** (≥ 98.0%, ≥ 98.0%ee) 1g $ 600

$C_{13}H_{23}NO_4$ =257.33





365023 **(*S*)-N-Fmoc-α-(4-Pentenyl)alanine** (≥ 98.0%, ≥ 98.0%ee) 5g (NET) $1,800

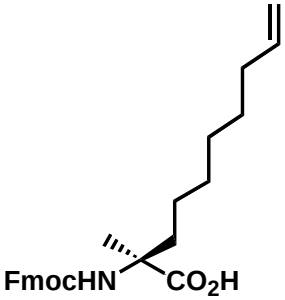
[CAS No.288617-73-2] $C_{23}H_{25}NO_4$ =379.46 1g (NET) $ 500

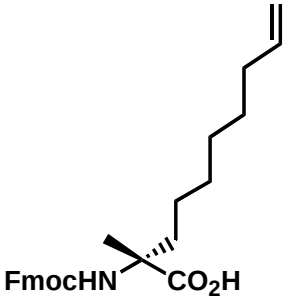
containing 20-50% of Methyl *tert*-Butyl ether (refrigerated transport)

364440 **(*R*)-N-Fmoc-α-(4-Pentenyl)alanine** (≥ 98.0%, ≥ 98.0%ee) 5g (NET) $ 1,800

[CAS No.288617-77-6] $C_{23}H_{25}NO_4$ =379.46 1g (NET) $ 500

containing 20-50% of Methyl *tert*-Butyl ether (refrigerated transport)



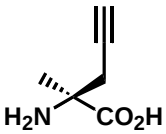


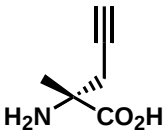
364441	**(*S*)-N-Fmoc-α-(7-Octenyl)alanine**	(≥ 98.0%, ≥ 98.0%ee)	5g (NET)	$ 1,900
	[CAS No.288617-75-4]	$C_{26}H_{31}NO_4$ =421.54	1g (NET)	$ 1,000
	Containing 10-40% of Methyl *tert*-Butyl ether	(refrigerated transport)		
363955	**(*R*)-N-Fmoc-α-(7-Octenyl)alanine**	(≥ 98.0%, ≥ 98.0%ee)	5g (NET)	$ 1,900
	[CAS No.945212-26-0]	$C_{26}H_{31}NO_4$ =421.54	1g (NET)	$ 1,000
	Containing 10-40% of Methyl *tert*-Butyl ether	(refrigerated transport)		

Hydrocarbon-stapling of natural peptides enhance helicity, protease resistance, and cell-permeability as well as improve pharmacologic properties.

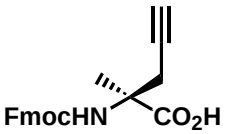
L. D. Walensky, et. al. *Science* **2004**, 305, 1466-1470.

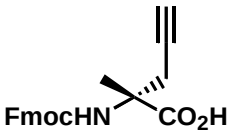
α-AlkynylAla





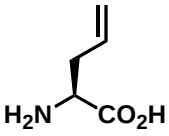
339271	**(*S*)-α-Propargylalanine**	(≥ 98.0%, ≥ 98.0%ee)	1g	$ 300
	[CAS No.1231709-27-5]	$C_6H_9NO_2$ =127.14		
339270	**(*R*)-α-Propargylalanine**	(≥ 98.0%, ≥ 98.0%ee)	1g	$ 300
	[CAS No.403519-98-2]	$C_6H_9NO_2$ =127.14		

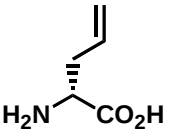




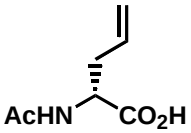
358026	**(*S*)-N-Fmoc-α-Propargylalanine**	(≥ 98.0%, ≥ 98.0%ee)	1g (NET)	$ 500
	[CAS No.1198791-58-0]	$C_{21}H_{19}NO_4$ =349.39		
	containing 20-50% Methyl *tert*-Bu ether	(refrigerated transport)		
358029	**(*R*) -N-Fmoc-α-Propargylalanine**	(≥ 98.0%, ≥ 98.0%ee)	1g (NET)	$ 500
	[CAS No.1198791-65-9]	$C_{21}H_{19}NO_4$ =349.39		
	containing 20-50% Methyl *tert*-Bu ether	(refrigerated transport)		

α-AlkenylGly

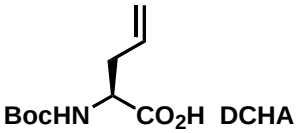




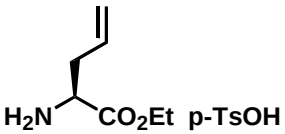
345277	**(*S*)-α-Allylglycine**	(≥ 98.0%, ≥ 98.0%ee)	5g	$ 500
	[CAS No.16338-48-0]	$C_5H_9NO_2$ =115.13		
345276	**(*R*)-α-Allylglycine**	(≥ 98.0%, ≥ 98.0%ee)	5g	$ 500
	[CAS No.54594-06-8]	$C_5H_9NO_2$ =115.13		



354273	**(*R*)-N-Acetyl-α-allylglycine**	(≥ 98.0%, ≥ 98.0%ee)	1g	$ 500
	[CAS No.121786-40-1]	$C_7H_{11}NO_3$ =157.17		



358025	**(*S*)-N-Boc-α-Allylglycine·Dicyclohexylamine salt**	(≥ 98.0%, ≥ 98.0%ee)	25g	$ 800
	[CAS No.143979-15-1]	$C_{22}H_{40}N_2O_4$ =396.57	100g	$ 2,500



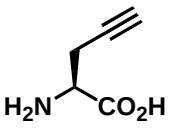
328549	**(*S*)-α-Allylglycine Ethyl ester· p-Toluenesulfonate**	(≥ 97.0%, ≥ 98.0%ee)	25g	$ 800
	[CAS No.1231709-21-9]	$C_{14}H_{21}NO_5S$ =315.39	100g	$ 2,500

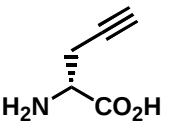
Applycation of Allylglycine as the building block for intermediate of pharmaceutical compounds.

Rutjes, F. P. J. T. et al. *Org. Biomol. Chem.* **2005**, *3*, 3435.

Rutjes, F. P. J. T. et al. *J. Chem. Soc. Perkin Trans. 1,* **2000**, 4197.

α-AlkynylGly

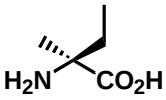


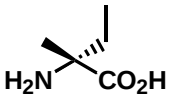


345279	**(*S*)-α-Propargylglycine**	(≥ 98.0%, ≥ 98.0%ee)	1g	$ 250
	[CAS No.23235-01-0]	$C_5H_7NO_2$ =113.11		
345278	**(*R*)-α-Propargylglycine**	(≥ 98.0%, ≥ 98.0%ee)	1g	$ 250
	[CAS No.23235-03-2]	$C_5H_7NO_2$ =113.11		

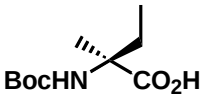
α-Methyl or α-Ethyl derivatives of natural Amino Acids

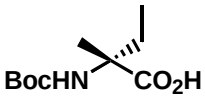
Alanine （Ala）



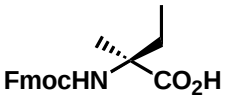


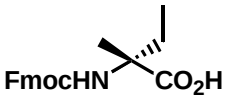
328959	**(*S*)-α-Ethylalanine·H_2O**	(≥ 98.0%, ≥ 98.0%ee)		1g	$ 250
	[CAS No.595-40-4]	$C_5H_{11}NO_2 \cdot H_2O$=135.16		5g	$ 800
328962	**(*R*)-α-Ethylalanine·H_2O**	(≥ 98.0%, ≥ 98.0%ee)		1g	$ 250
	[CAS No.3059-97-0]	$C_5H_{11}NO_2 \cdot H_2O$=135.16		5g	$ 800





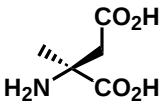
358835	**(*S*)-N-Boc-α-Ethylalanine**	(≥ 98.0%, ≥ 98.0%ee)		1g	$ 300
	[CAS No.151171-11-8]	$C_{10}H_{19}NO_4$ =217.26		5g	$ 900
395454	**(*R*)-N-Boc-α-Ethylalanine**	(≥ 98.0%, ≥ 98.0%ee)		1g	$ 300
	[CAS No.123254-58-0]	$C_{10}H_{19}NO_4$ =217.26		5g	$ 900

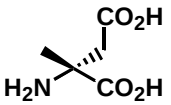




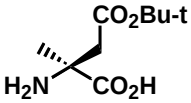
354274	**(*S*)-N-Fmoc-α-Ethylalanine**	(≥ 98.0%, ≥ 98.0%ee)	1g	$ 400	
	[CAS No.857478-30-9]	$C_{20}H_{21}NO_4$ =339.39		5g	$ 1,600
	(refrigerated transport)				
354275	**(*R*)-N-Fmoc-α-Ethylalanine**	(≥ 98.0%, ≥ 98.0%ee)	1g	$ 400	
	[CAS No.1231709-22-0]	$C_{20}H_{21}NO_4$ =339.39		5g	$ 1,600
	(refrigerated transport)				

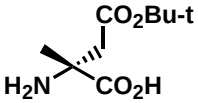
Aspartic acid (Asp)





346838	**(*S*)-α-Methylaspartic acid**	(≥ 98.0%, ≥ 98.0%ee)		1g	$ 400
	[CAS No.3227-17-6]	$C_5H_9NO_4$ =147.13			
346839	**(*R*)-α-Methylaspartic acid**	(≥ 98.0%, ≥ 98.0%ee)		1g	$ 400
	[CAS No.14603-76-0]	$C_5H_9NO_4$ =147.13			



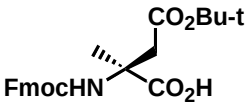


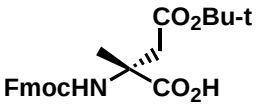
357392 **(*S*)-α-Methylaspartic acid-4-*tert*-butyl ester** (≥ 98.0%, ≥ 98.0%ee) 1g $ 230

[CAS No.1217977-71-3] $C_9H_{17}NO_4$ =203.24 5g $ 650

359455 **(*R*)-α-Methylaspartic acid-4-*tert*-butyl ester** (≥ 98.0%, ≥ 98.0%ee) 1g $ 230

[CAS No.1231709-25-3] $C_9H_{17}NO_4$ =203.24 5g $ 650





357393 **(*S*)-N-Fmoc-α-Methylaspartic acid-4-*tert*-butyl ester** (≥ 98.0%, ≥ 98.0%ee) 1g (NET) $ 600

[CAS No.1072845-47-6] $C_{24}H_{27}NO_6$ =425.47 5g (NET) $ 1,400

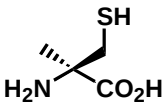
containing 10% Methyl *tert*-Bu ether (refrigerated transport)

359457 **(*R*)-N-Fmoc-α-Methylaspartic acid-4-*tert*-butyl ester** (≥ 98.0%, ≥ 98.0%ee) 1g (NET) $ 600

[CAS No.1231709-26-4] $C_{24}H_{27}NO_6$ =425.47 5g (NET) $ 1,400

containing 10% Methyl *tert*-Bu ether (refrigerated transport)

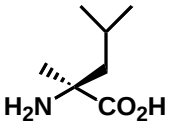
Cysteine (Cys) New

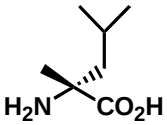


365408 **(*R*)-L-α-Methylcysteine·HCl** (≥ 98.0%, ≥ 98.0%ee) 1g $ 400

[CAS No. 148766-37-4] $C_4H_{10}NO_2ClS$=171.64 5g $ 1,600

Leucine (Leu)



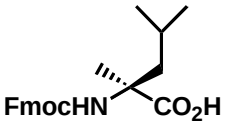


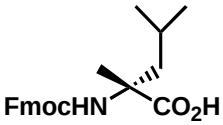
328961 **(*S*)-α-Methylleucine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 250

[CAS No.105743-53-1] $C_7H_{15}NO_2$ =145.20

328960 **(*R*)-α-Methylleucine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 250

[CAS No.29589-03-5] $C_7H_{15}NO_2$ =145.20





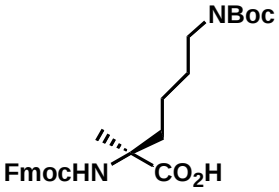
357394 **(*S*)-N-Fmoc-α- Methylleucine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 700

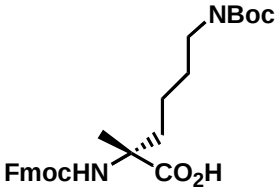
[CAS No.312624-65-0] $C_{22}H_{25}NO_4$ =367.44 (refrigerated transport)

357395 **(*R*)-N-Fmoc-α-Methylleucine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 700

[CAS No.1231709-23-1] $C_{22}H_{25}NO_4$ =367.44 (refrigerated transport)

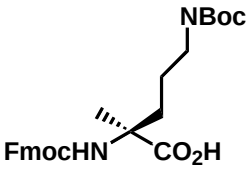
Lysine (Lys) New

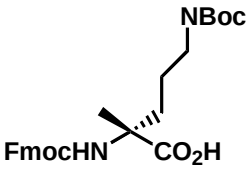




369412	**(*S*)-N$_\alpha$-Fmoc-α-Methyl-N$_\omega$-Boc-lysine** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 700
	[CAS No.1202003-49-3]	$C_{27}H_{34}N_2O_6$=482.58 (refrigerated transport)	5g	$ 2,400
369414	**(*R*)-N$_\alpha$-Fmoc-α-Methyl-N$_\omega$-Boc-lysine** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 700
		$C_{27}H_{34}N_2O_6$=482.58 (refrigerated transport)	5g	$ 2,400

Ornithine (Orn) New

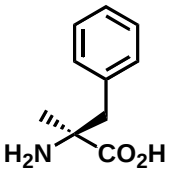


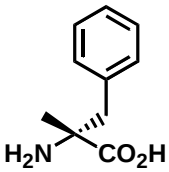


369026	**(*S*)-N$_\alpha$-Fmoc-α-Methyl-N$_\omega$-Boc-ornithine** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 600
		$C_{26}H_{32}N_2O_6$=468.55 (refrigerated transport)	5g	$ 2,000
369413	**(*R*)-N$_\alpha$-Fmoc-α-Methyl-N$_\omega$-Boc-ornithine** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 600
	[CAS No.171860-40-5]	$C_{26}H_{32}N_2O_6$=468.55 (refrigerated transport)	5g	$ 2,000

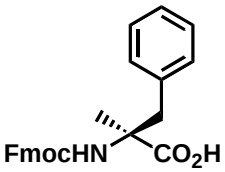
Phenylalanine (Phe)

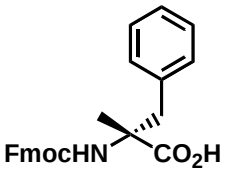
Substituted benzene ring derivatives are shown in pp. 10-11





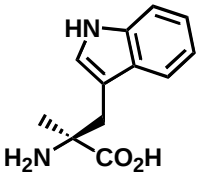
322901	**(*S*)-α-Methylphenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 300
	[CAS No. 23239-35-2]	$C_{10}H_{13}NO_2 \cdot H_2O$ =197.23	5g	$ 900
322898	**(*R*)-α-Methylphenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 300
	[CAS No. 17350-84-4]	$C_{10}H_{13}NO_2 \cdot H_2O$ =197.23	5g	$ 900

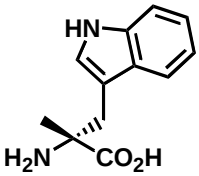




366011	**(*S*)-N-Fmoc-α-Methylphenylalanine·3/2H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 300
	[CAS No. 135944-05-7]	$C_{25}H_{23}NO_4 \cdot 3/2H_2O$ =428.49	5g	$ 900
366012	**(*R*)-N-Fmoc-α-Methylphenylalanine·3/2H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 300
	[CAS No. 152436-04-9]	$C_{25}H_{23}NO_4 \cdot 3/2H_2O$ =428.49	5g	$ 900

Tryptophan (Trp)



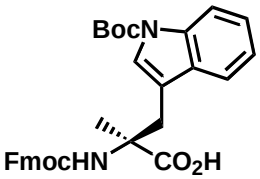


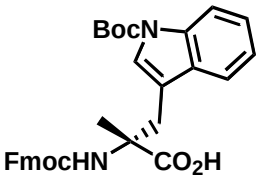
350920 **(*S*)-α-Methyltryptophan·1/2H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 700

[CAS No.16709-25-4] $C_{12}H_{14}N_2O_2 \cdot 1/2H_2O$=227.26

350921 **(*R*)-α-Methyltryptophan·1/2H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 700

[CAS No.56452-52-9] $C_{12}H_{14}N_2O_2 \cdot 1/2H_2O$=227.26





359456 **(*S*)-N-Fmoc-α-Methyl-N'-Boc-tryptophan** (≥ 98.0%, ≥ 98.0%ee) 1g (NET) $ 1,200

$C_{32}H_{32}N_2O_6$ =540.61

containing 5% n-Heptane (refrigerated transport)

365299 **(R)-N-Fmoc-α-Methyl-N'-Boc-tryptophan** (≥ 98.0%, ≥ 98.0%ee) 1g (NET) $ 1,200

[CAS No.220155-72-6] $C_{32}H_{32}N_2O_6$ =540.61

containing 5% n-Heptane (refrigerated transport)

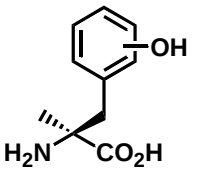
Boyle, S. et al. *Bioorganic & Medicinal Chemistry* **1994**, 2, 357.

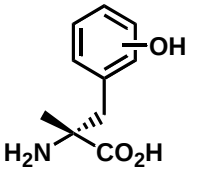
van Megen, H. J. et al. *Psychophormacology (Berlin)* **1997**, 129, 243.

Dethlof, L. A. et al. *Food Chem. Toxicol*. **1998**, 36, 61.

Valerie, A. et al. *J. Med. Chem*. **2001**, 44, 2276.

Tyrosine (Tyr)





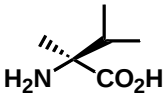
339269 **(*S*)-α-Methyl-4-hydroxyphenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 250

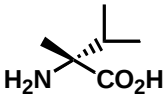
(*S*)-α-Methyltyrosine [CAS No.672-87-7] $C_{10}H_{13}NO_3$ =195.22

339268 **(*R*)-α-Methyl-4-hydroxyphenylalanine**(≥ 98.0%, ≥ 98.0%ee) 1g $ 250

(*R*)-α-Methyltyrosine [CAS No.672-86-6] $C_{10}H_{13}NO_3$ =195.22

Valine (Val)



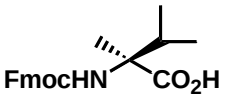


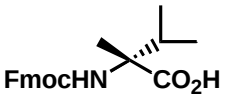
333444 **(*S*)-α-Methylvaline**(≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[CAS No.53940-83-3] $C_6H_{13}NO_2$ =131.17

333443 **(*R*)-α-Methylvaline** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[CAS No.53940-82-2] $C_6H_{13}NO_2$ =131.17





358030 **(*S*)- N-Fmoc-α-Methylvaline** (≥ 98.0%, ≥ 98.0%ee) 1g (NET) $ 400

[CAS No.169566-81-8] $C_{21}H_{23}NO_4$ =353.42

containing 10% Methyl *tert*-Bu ether (refrigerated transport)

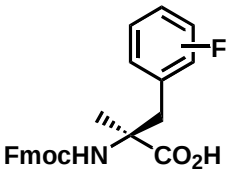
358031 **(*R*)-N-Fmoc-α-Methylvaline** (≥ 98.0%, ≥ 98.0%ee) 1g (NET) $ 400

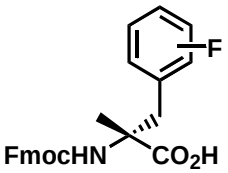
[CAS No.616867-28-8] $C_{21}H_{23}NO_4$ =353.42

containing 10% Methyl *tert*-Bu ether (refrigerated transport)

α-Methyl-substituted-phenylalanines

F-Phe





365442 **(*S*)- N-Fmoc-α-Methyl-2-fluorophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

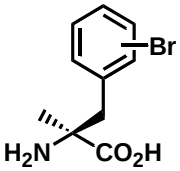
[CAS No.1172127-44-4] $C_{25}H_{22}FNO_4$ = 419.45

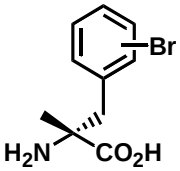
364680 **(*R*)- N-Fmoc-α-Methyl-2-fluorophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

$C_{25}H_{22}FNO_4$ = 419.45

Mapelli C. et. al. *J. Med. Chem.* **2009**, 52, 7788 – 7799.

Br-Phe





322899 **(*S*)-α-Methyl-2-bromophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $450

[CAS No.1212180-27-2] $C_{10}H_{12}BrNO_2 \cdot H_2O$ = 276.13

322894 **(*R*)-α-Methyl-2-bromophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 450

[CAS No.1212307-90-8] $C_{10}H_{12}BrNO_2 \cdot H_2O$ = 276.13

328956 **(*S*)-α-Methyl-3-bromophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[CAS No.1212117-73-1] $C_{10}H_{12}BrNO_2 \cdot H_2O$ = 276.13

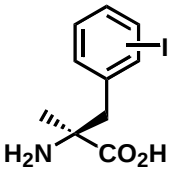
328957 **(*R*)-α-Methyl-3-bromophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

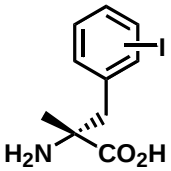
[CAS No.1212321-90-8] $C_{10}H_{12}BrNO_2 \cdot H_2O$ = 276.13

322900 **(*S*)-α-Methyl-4-bromophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 400

[CAS No.747397-27-9] $C_{10}H_{12}BrNO_2$ = 258.11

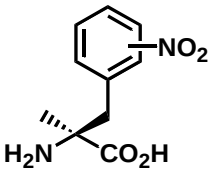
I-Phe

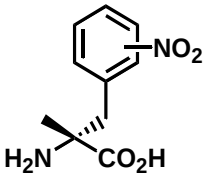




329205	**(*S*)-α-Methyl-3-iodophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 350
	[CAS No.457653-01-9]	$C_{10}H_{12}INO_2 \cdot H_2O$ = 323.13		
329207	**(*R*)-α-Methyl-3-iodophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 350
	[CAS No.457652-83-4]	$C_{10}H_{12}INO_2 \cdot H_2O$ = 323.13		
329206	**(*S*)-α-Methyl-4-iodophenylalanine** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 300
	[CAS No.1215092-16-2]	$C_{10}H_{12}INO_2$= 305.11		
329204	**(*R*)-α-Methyl-4-iodophenylalanine** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 300
	[CAS No.213203-06-6]	$C_{10}H_{12}INO_2$= 305.11		

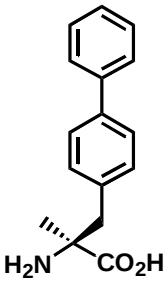
NO_2-Phe





333075	**(*S*)-α-Methyl-2-nitrophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 200
		$C_{10}H_{12}N_2O_4 \cdot H_2O$ = 242.23		
333080	**(*R*)-α-Methyl-2-nitrophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 200
		$C_{10}H_{12}N_2O_4 \cdot H_2O$ = 242.23		
333078	**(*S*)-α-Methyl-3-nitrophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 200
	[CAS No.121509-14-0]	$C_{10}H_{12}N_2O_4 \cdot H_2O$ = 242.23		
333076	**(*R*)-α-Methyl-3-nitrophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 200
	[CAS No. 121509-13-9]	$C_{10}H_{12}N_2O_4 \cdot H_2O$ = 242.23		

4-Ph-Phe



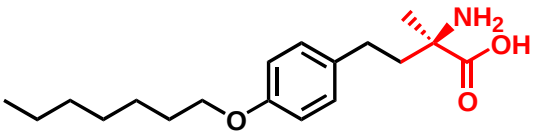
335436	**(*S*)-α-Methyl-β-(4-biphenyl)alanine·H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 300
	[CAS No.1231709-24-2]	$C_{16}H_{17}NO_2 \cdot H_2O$ = 273.33		

Application of Unnatural Amino Acids for Pharmaceuticals

Replacement of the α-hydrogen atom of L-α-Amino acids with an alkyl substituent, which results in α,α-disubstituted amino acids has been reported. The modification changes the properties of amino acids as follows: 1) increase of chemical stability, 2) increase of hydrophobicity, 3) restriction of conformational freedom of side chains in amino acids, 4) restriction of conformational freedom of their peptides, 5) metabolic stability of their peptides.

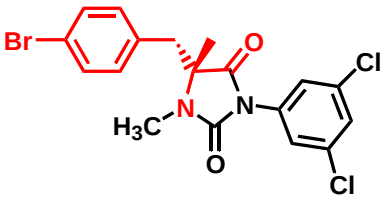
Tanaka, M. *Chem. Pharn. Bull.* **2007**, 55, 349-358.

Examples of investigational API including α,α-disubstituted amino acids.



Chiral Analogue of Single S1P Receptor

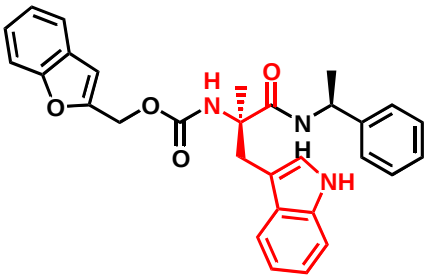
Albert, R. et al. *J. Med. Chem*. **2005**, 48, 5373-5377.



Integrin ab-2 (LFA-1) Antagonist

LFA-1/ICAM-1 Interaction Inhibitors

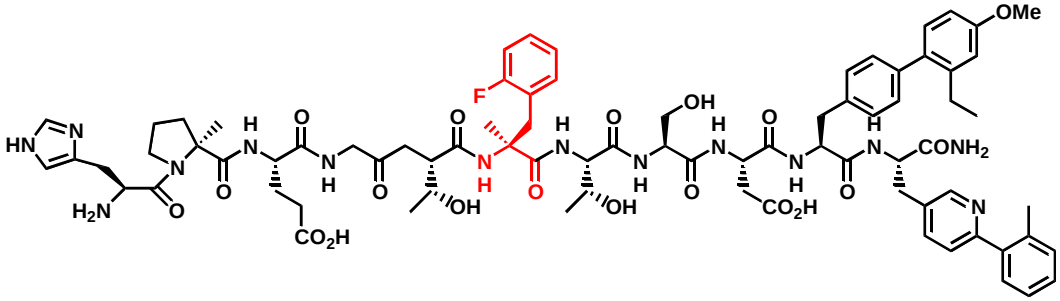
Kelly, T.A. et al. *J. Immunol,* **1999**, 163, 5173-5177



NK1 Receptor Antagonist

Boyle, S.et al. *Bioorganic & Medicinal Chemistry* **1994**, 2, 357.

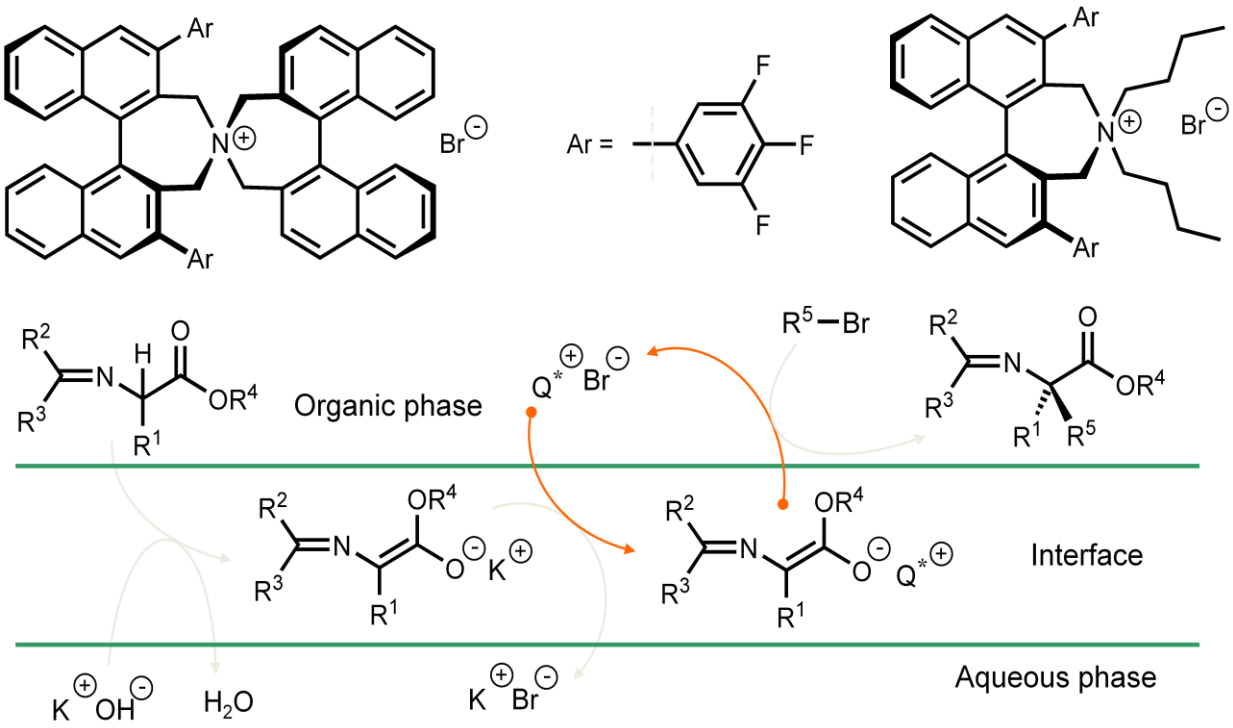
Ashwood, V. A. et al. *J. Med. Chem*. **2001**, 44, 2276-2285.



Glucagon –like Peptide-1 Receptor Agonist with Antidiabetic Activity

Mapelli, C. et. al. *J. Med. Chem.* **2009**, 52, 7788 – 7799.

Asymmetric Phase-Transfer Reaction with Maruoka Catalyst® to Make α- Monosubstituted and α, α-Disubstituted Amino Acids.



Ikunaka, M. and Maruoka, K. 'Asymmetric Phase-Transfer Catalysts for the Production of Non-Proteinogenic alpha-Amino Acids' in *Asymmetric Catalysis on Industrial Scale 2nd edition*, Blaser, H-U. and Federsel, H.-J. eds. Wiley-VCH Verlag GmbH & Co. KGaA (**2010**)

Reference:

Ooi, T., Kameda, M., and Maruoka, K. *J. Am. Chem. Soc*., **2003**, 125, 5139-5151.

Ooi, T., Kameda,M., Tannai, H., and Maruoka, K. *Tetrahedron Lett.*, **2000**, 41, 8339-8342.

Ooi, T., Takeuchi.,M., and Maruoka, K. *Synthesis* **2001**, 1716-1718.

Maruoka, K. *Org. Process Research & Development* **2008**, 12, 679-687.

Patents:

USP 6340753

JP 4217085

Patent Pending: PCT/JP01/03373, PCT/JP2005/001623, PCT/JP/306791, PCT/JP2006/315457

General Information:

Company Profile:

Mission: 'Maintain Good and Fair Business Practice' (誠実に正道を歩む)

Nagase & Co., Ltd., the nucleus of our group, was established as a dyestuffs wholesaler in Kyoto, Japan in 1832. Since then, Nagase has opened up new markets worldwide together with its customers and accumulated considerable know-how in its role as 'a technology and intelligence oriented trading company.' At the same time, it has enhanced its capabilities with new R&D, manufacturing and processing. Today, The Nagase Group is a US$6.4 billion (FY March 2010) company and offers customers trading, marketing, R&D and manufacturing functions in its four strategic areas of Chemicals, Plastics, Electronics and Life Sciences. The Nagase Group continues to offer new proposals as *'a technology and intelligence oriented company that turns wisdom into business.'*

Sales Information of unnatural amino acids:

Prices:

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Ordering:

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Abbreviation:

Ac	Acetyl
Boc	tert-Butyloxycarbonyl
DCHA	Dicyclohexylammonium salt
Fmoc	9-Flourenylmethoxycarbonyl
Bu-t	*tert*-Butyl
TsOH	p-Toluenesulfonic acid

Production sites of Nagase Company's Group:

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