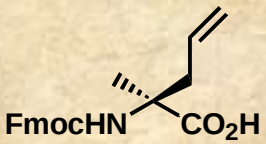
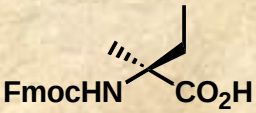
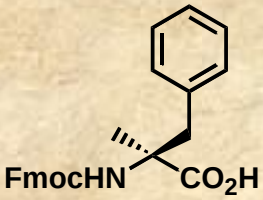
Nagase's Library of Unnatural Amino Acids

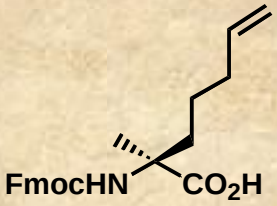
September 2014 Ver.20

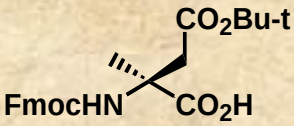
Nagase provides unique α-mono substituted and α,α- disubstituted unnatural amino acids
which open new avenues for designing drug candidates
and streamlining the production of drugs in the pipeline,
which can be supplied in multi-kg and greater quantities via stereoselective alkylation
of glycine or alanine
and which contain no metal so are safe for API production
and environmentally friendly.

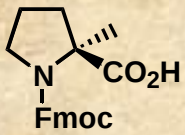


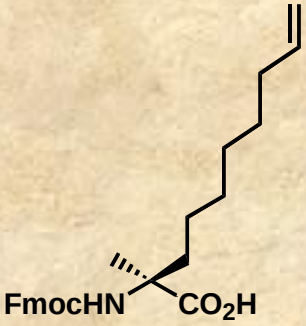


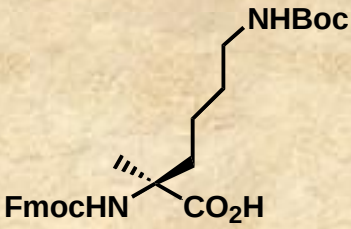


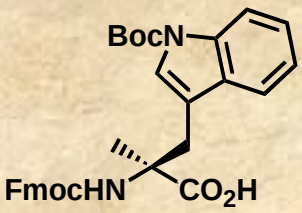












NAGASE

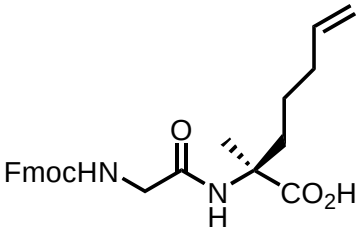
New Service!

Di-Peptides synthesized from our Unnatural Amino Acids

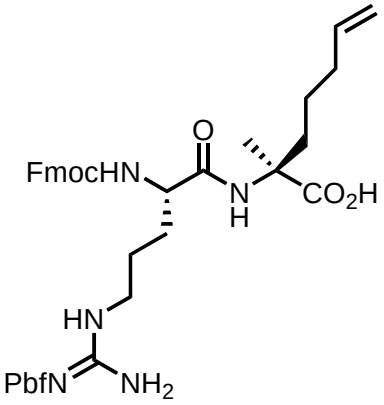
Nagase is developing a range di-peptides which are composed of a natural amino acid connected to N-terminal of our unnatural, alpha, alpha-di-alkylated amino acids.

Usually alpha, alpha-di-alkylated amino acids are not so reactive with other natural amino acids at the N-terminal position because of their steric hindrance around the chiral carbon center.
That is the reason why you may have obtained a peptide in low yield as a result of incomplete conjugation of the amino acid adjacent to the dialkylated amino acid.
As a result Nagase commissioned certain peptide custom synthesis companies in Japan and China to provide N-Fmoc-protected di-peptide which is composed of a natural amino acid and alpha, alpha-di-alkylated amino acid and can be used in solid phase peptide synthesis

Examples



Fmoc-Gly-(*S*)-Ala(4-Pte)-OH



Fmoc-Arg(Pbf)-(*S*)-Ala(4-Pte)-OH

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

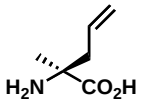
α-AlkenylAla

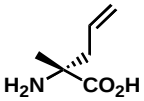
335438 **(*S*)-α-Allylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[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)

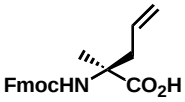
[CAS No.288617-71-0] $C_{21}H_{21}NO_4$ = 351.40 (NET) 1g $ 760(*)

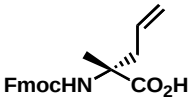
containing 20-50% Methyl *tert*-butyl ether

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 (NET) 1g $ 760(*)

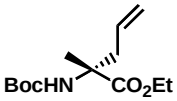
containing 20-50% Methyl *tert*-butyl ether





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

[CAS No.1263046-12-3] $C_{13}H_{23}NO_4$ = 257.33



365023 **(*S*)-N-Fmoc-α-(4-Pentenyl)alanine** (≥ 98.0%, ≥ 98.0%ee) (NET) 1g $ 500(*)

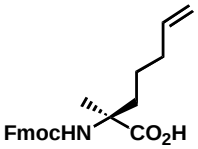
[CAS No.288617-73-2] $C_{23}H_{25}NO_4$ = 379.46 (NET) 5g $ 1,800(*)

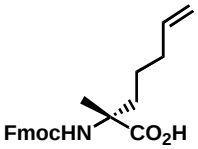
containing 20-50% of Methyl *tert*-Butyl ether (refrigerated transport)

364440 **(*R*)-N-Fmoc-α-(4-Pentenyl)alanine** (≥ 98.0%, ≥ 98.0%ee) (NET) 1g $ 500(*)

[CAS No.288617-77-6] $C_{23}H_{25}NO_4$ = 379.46 (NET) 5g $ 1,800(*)

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





411751 **(*S*)-α-(4-Pentenyl)alanine *tert*-Butyl ester *p*-Nitrobenzoate** (≥ 98.0%, ≥ 98.0%ee)

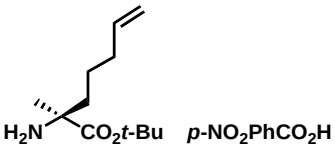
[CAS No.1323987-70-7] $C_{12}H_{23}NO_2 \cdot C_7H_5NO_4$= 380.44 1g $ 350

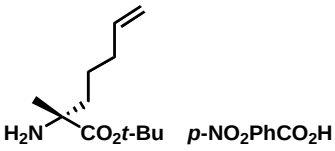
5g $ 1,400

411752 **(*R*)-α-(4-Pentenyl)alanine *tert*-Butyl ester *p*-Nitrobenzoate** (≥ 98.0%, ≥ 98.0%ee)

[CAS No.1323987-68-3] $C_{12}H_{23}NO_2 \cdot C_7H_5NO_4$= 380.44 1g $ 350

5g $ 1,400





364441 **(*S*)-N-Fmoc-α-(7-Octenyl)alanine** (≥ 98.0%, ≥ 98.0%ee) (NET) 1g $ 1,000(*)

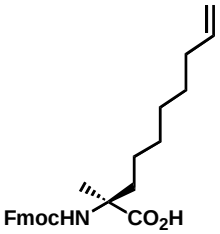
[CAS No.288617-75-4] $C_{26}H_{31}NO_4$ = 421.54 (NET) 5g $ 1,900(*)

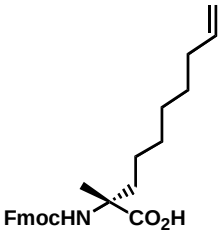
Containing 10-40% of Methyl *tert*-butyl ether (refrigerated transport)

363955 **(*R*)-N-Fmoc-α-(7-Octenyl)alanine** (≥ 98.0%, ≥ 98.0%ee) (NET) 1g $ 1,000(*)

[CAS No.945212-26-0] $C_{26}H_{31}NO_4$ = 421.54 (NET) 5g $ 1,900(*)

Containing 10-40% of Methyl *tert*-butyl ether (refrigerated transport)





411915 **(*S*)-α-(7-Octenyl)alanine *tert*-Butyl ester *p*-Nitrobenzoate** (≥ 98.0%, ≥ 98.0%ee)

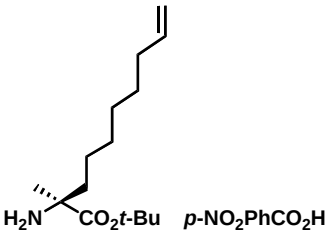
[CAS No.1375908-92-1] $C_{15}H_{29}NO_2 \cdot C_7H_5NO_4$= 422.52 1g $ 700

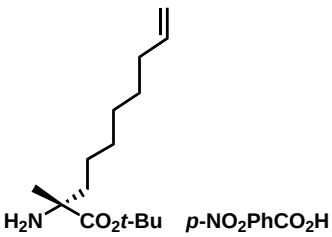
5g $ 1,500

388630 **(*R*)-α-(7-Octenyl)alanine *tert*-Butyl ester *p*-Nitrobenzoate** (≥ 98.0%, ≥ 98.0%ee)

[CAS No.1375904-22-5] $C_{15}H_{29}NO_2 \cdot C_7H_5NO_4$= 422.52 1g $ 700

5g $ 1,500





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

C. E. Schafmeister, *et. al*. *J. Am.Chem.Soc*. **2000**, *122*, 5891-5892. L. D . Walensky, *et. al. Science* **2004**, *305*, 1466-1470.

Young-Woo Kim *et. al*. *Org. Lett*. **2010**, *12*, 3046-3049.

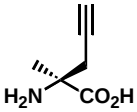
α-AlkynylAla

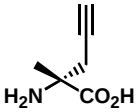
339271 **(*S*)-α-Propargylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[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) (NET) 1g $ 500(*)

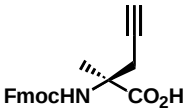
[CAS No.1198791-58-0] $C_{21}H_{19}NO_4$ = 349.39

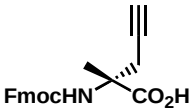
containing 20-50% Methyl *tert*-butyl ether (refrigerated transport)

358029 **(*R*) -N-Fmoc-α-Propargylalanine** (≥ 98.0%, ≥ 98.0%ee) (NET) 1g $ 500(*)

[CAS No.1198791-65-9] $C_{21}H_{19}NO_4$ = 349.39

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





385412 **(*S*)-N-Fmoc-α-(4-Pentynyl)alanine** (≥ 98.0%, ≥ 98.0%ee) (NET) 1g $ 800(*)

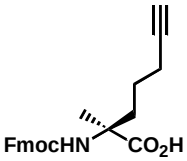
[CAS No.1050501-65-9] $C_{23}H_{23}NO_4$ = 377.44 (NET) 5g $ 2,400(*)

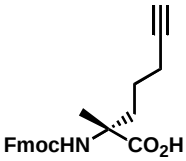
containing 20-50% of Methyl *tert*-butyl ether (refrigerated transport)

385411 **(*R*)-N-Fmoc-α-(4-Pentynyl)alanine** (≥ 98.0%, ≥ 98.0%ee) (NET) 1g $ 800(*)

[CAS No.1198791-56-8] $C_{23}H_{23}NO_4$ = 377.44 (NET) 5g $ 2,400(*)

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





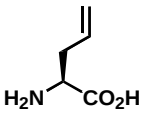
α-AlkenylGly

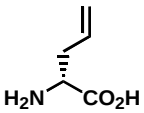
345277 **(*S*)-α-Allylglycine** (≥ 98.0%, ≥ 98.0%ee) 5g $ 500

[CAS No.16338-48-0] $C_5H_9NO_2$ = 115.13

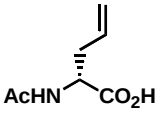
345276 **(*R*)-α-Allylglycine** (≥ 98.0%, ≥ 98.0%ee) 5g $ 500

[CAS No.54594-06-8] $C_5H_9NO_2$ = 115.13

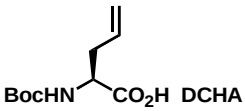




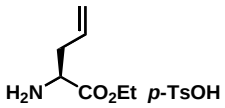
354273	**(*R*)-N-Acetyl-α-allylglycine** (≥ 98.0%, ≥ 98.0%ee)	1g	$ 500
	[CAS No.121786-40-1] $C_7H_{11}NO_3$ = 157.17		

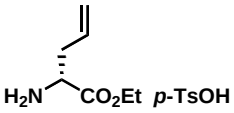


358025	**(*S*)-N-Boc-α-Allylglycine Dicyclohexylamine salt** (≥ 98.0%, ≥ 98.0%ee)	25g	$ 800
	[CAS No.143979-15-1] $C_{22}H_{40}N_2O_4$ = 396.57	100g	$ 2,500



363068	**(*S*)-α-Allylglycine Ethyl ester *p*-Toluenesulfonate** (≥ 97.0%, ≥ 98.0%ee)	5g	$ 200
	[CAS No.1231709-21-9] $C_{14}H_{21}NO_5S$ = 315.39	25g	$ 800
		100g	$ 2,500
413726	**(*R*)-α-Allylglycine Ethyl ester *p*-Toluenesulfonate** (≥ 97.0%, ≥ 98.0%ee)	5g	$ 200
	[CAS No.1432914-51-6] $C_{14}H_{21}NO_5S$ = 315.39	25g	$ 800
		100g	$ 2,500





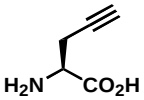
Applycation of Allylglycine as the building block for intermediate of pharmaceutical compounds.

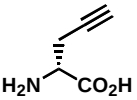
Rutjes, F. P. J. T. *et al*. *Org. Biomol. Chem.* **2005**, *3*, 3435.

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] $C_5H_7NO_2$ = 113.12		
345278	**(*R*)-α-Propargylglycine** (≥ 98.0%, ≥ 98.0%ee)	1g	$ 250
	[CAS No.23235-03-2] $C_5H_7NO_2$ = 113.12		





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

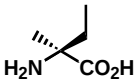
Alanine （Ala）

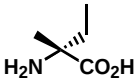
328959 **(*S*)-α-Ethylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 250

[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



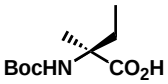


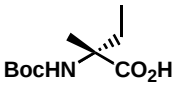
358835 **(*S*)-N-Boc-α-Ethylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[CAS No.151171-11-8] $C_{10}H_{19}NO_4$ = 217.27 5g $ 900

395454 **(*R*)-N-Boc-α-Ethylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[CAS No.123254-58-0] $C_{10}H_{19}NO_4$ = 217.27 5g $ 900





354274 **(*S*)-N-Fmoc-α-Ethylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 400(*)

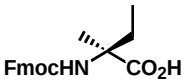
[CAS No.857478-30-9] $C_{20}H_{21}NO_4$ = 339.39 5g $ 1,600(*)

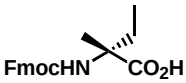
(refrigerated transport)

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)





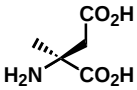
Aspartic acid (Asp)

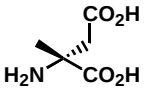
346838 **(*S*)-α-Methylaspartic acid** (≥ 98.0%, ≥ 98.0%ee) 1g $ 400

[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



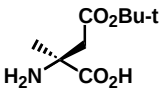


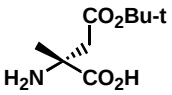
357392 **(*S*)-α-Methylaspartic acid-4-*tert*-butyl ester** (≥ 98.0%, ≥ 98.0%ee) 1g $ 230

[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) (NET) 1g $ 600(*)

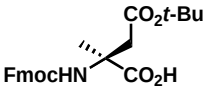
[CAS No.1072845-47-6] $C_{24}H_{27}NO_6$ = 425.48 (NET) 5g $ 1,400(*)

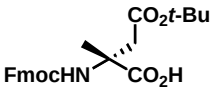
containing ≤10% Methyl *tert*-butyl ether (refrigerated transport)

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

[CAS No.1231709-26-4] $C_{24}H_{27}NO_6$ = 425.48 (NET) 5g $ 1,400(*)

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





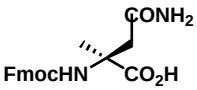
Asparagine(Asn)

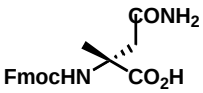
412813 **(*S*)-N-Fmoc-α-Methylasparagine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 600

[CAS No.1403590-49-7] $C_{20}H_{20}N_2O_5$ = 368.39 5g $ 1,800

412814 **(*R*)-N-Fmoc-α-Methylasparagine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 600

[CAS No.1403590-50-0] $C_{20}H_{20}N_2O_5$ = 368.39 5g $ 1,800





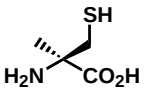
Cysteine (Cys)

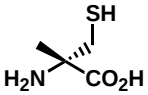
369043 **(*R*)-L-α-Methylcysteine·HCl** (≥ 98.0%, ≥ 98.0%ee) 1g $ 400

[CAS No. 148766-37-4] $C_4H_9NO_2S$·HCl = 171.65 5g $ 1,600

388254 **(*S*)-D-α-Methylcysteine·HCl** (≥ 98.0%, ≥ 98.0%ee) 1g $ 1,500

[CAS No.151062-55-4] $C_4H_9NO_2S$·HCl = 171.65





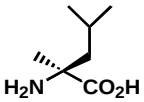
Leucine (Leu)

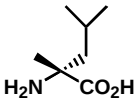
328961 **(*S*)-α-Methylleucin** (≥ 98.0%, ≥ 98.0%ee) 1g $ 250

[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



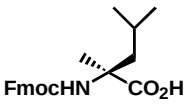


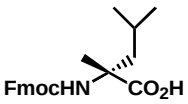
357394 **(*S*)-N-Fmoc-α- Methylleucine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 700(*)

[CAS No.312624-65-0] $C_{22}H_{25}NO_4$ = 367.45 (refrigerated transport)

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

[CAS No.1231709-23-1] $C_{22}H_{25}NO_4$ = 367.45 (refrigerated transport)





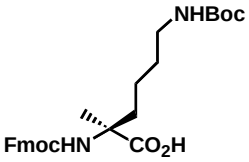
Lysine (Lys)

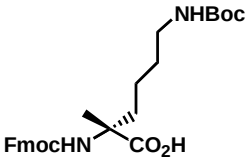
369412 **(*S*)-$N_α$-Fmoc- $N_ω$–Boc-α-Methyllysine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 700(*)

[CAS No.1202003-49-3] $C_{27}H_{34}N_2O_6$ = 482.58 (refrigerated transport) 5g $ 2,400(*)

369414 **(*R*)-$N_α$-Fmoc- $N_ω$-Boc-α-Methyllysine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 700(*)

[CAS No.1315449-94-5] $C_{27}H_{34}N_2O_6$ = 482.58 (refrigerated transport) 5g $ 2,400(*)





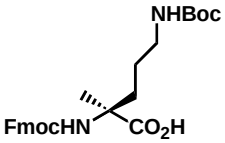
Ornithine (Orn)

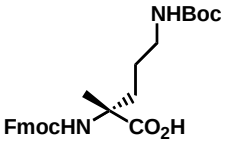
369026 **(*S*)-$N_α$-Fmoc- $N_ω$-Boc-α-Methylornithine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 600(*)

[CAS No.1315449-95-6] $C_{26}H_{32}N_2O_6$ = 468.55 (refrigerated transport) 5g $ 2,000(*)

369413 **(*R*)-$N_α$-Fmoc- $N_ω$-Boc-α-Methylornithine** (≥ 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)

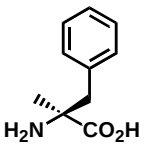
Substituted benzene ring derivatives are shown in pp. 10-11

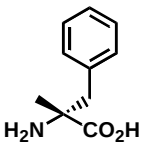
322901 **(*S*)-α-Methylphenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[CAS No. 23239-35-2] $C_{10}H_{13}NO_2 \cdot H_2O$ = 197.23 5g $ 900

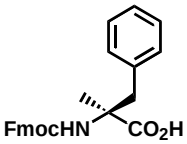
322898 **(*R*)-α-Methylphenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

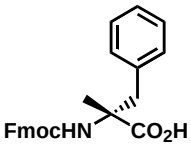
[CAS No. 17350-84-4] $C_{10}H_{13}NO_2 \cdot H_2O$ = 197.23 5g $ 900





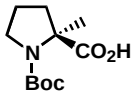
366011	**(*S*)-N-Fmoc-α-Methylphenylalanine·3/2H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 300
	[CAS No. 135944-05-7]	$C_{25}H_{23}NO_4 \cdot 3/2H_2O$ = 428.48	5g	$ 900
366012	**(*R*)-N-Fmoc-α-Methylphenylalanine·3/2H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 300
	[CAS No. 152436-04-9]	$C_{25}H_{23}NO_4 \cdot 3/2H_2O$ = 428.48	5g	$ 900

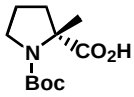




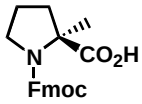
Proline (Pro)

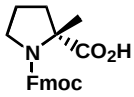
363402	**(*S*)-N-Boc-α-Methylproline** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 400
	[CAS No. 103336-06-7]	$C_{11}H_{19}NO_4$ = 229.28	5g	$ 1,200
363401	**(*R*)-N-Boc-α-Methylproline** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 400
	[CAS No. 166170-15-6]	$C_{11}H_{19}NO_4$ = 229.28	5g	$ 1,200





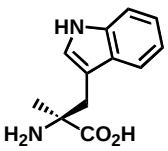
386844	**(*S*)-N-Fmoc-α-Methylproline** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 500
	[CAS No.167275-47-0]	$C_{21}H_{21}NO_4$ = 351.40	5g	$ 1,500
386843	**(*R*)-N-Fmoc-α-Methylproline** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 500
		$C_{21}H_{21}NO_4$ = 351.40	5g	$ 1,500

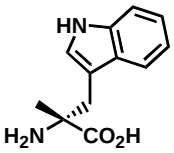




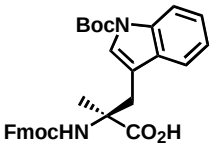
Tryptophan (Trp)

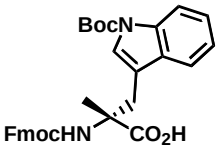
350920	**(*S*)-α-Methyltryptophan·1/2H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 700
	[CAS No.16709-25-4]	$C_{12}H_{14}N_2O_2 \cdot 1/2H_2O$ = 227.26		
350921	**(*R*)-α-Methyltryptophan·1/2H_2O** (≥ 98.0%, ≥ 98.0%ee)		1g	$ 700
	[CAS No.56452-52-9]	$C_{12}H_{14}N_2O_2 \cdot 1/2H_2O$ = 227.26		





359456	**(*S*)-N-Fmoc-N'-Boc-α-Methyltryptophan** (≥ 98.0%, ≥ 98.0%ee)		(NET) 200mg	$ 600(*)
	[CAS No.1315449-98-9]	$C_{32}H_{32}N_2O_6$ = 540.62	(NET) 1g	$ 1,200(*)
	containing 5% *n*-Heptane	(refrigerated transport)		
365299	**(*R*)-N-Fmoc-N'-Boc-α-Methyltryptophan** (≥ 98.0%, ≥ 98.0%ee)		(NET) 200mg	$ 600(*)
	[CAS No.220155-72-6]	$C_{32}H_{32}N_2O_6$ = 540.62	(NET) 1g	$ 1,200(*)
	containing 5% *n*-Heptane	(refrigerated transport)		





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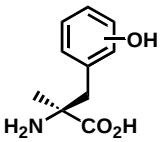
Tyrosine (Tyr)

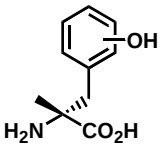
339269 **(*S*)-α-Methyl-4-hydroxyphenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 250

(*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

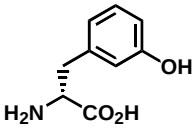
(*R*)-α-Methyltyrosine [CAS No.672-86-6] $C_{10}H_{13}NO_3$ = 195.22





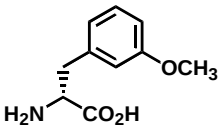
387902 **(*R*)-D-*m*-Tyrosine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 500

[CAS No.32140-49-1] $C_9H_{11}NO_3$ = 181.19



387901 **(*R*)-3-Methoxyphenylalanine monohydrate** (≥ 98.0%, ≥ 98.0%ee) 1g $ 700

[CAS No.145306-65-6] $C_{10}H_{13}NO_3 \cdot H_2O$ = 213.23



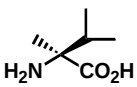
Valine (Val)

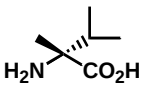
333444 **(*S*)-α-Methylvaline**(≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[CAS No.53940-83-3] $C_6H_{13}NO_2$ = 131.18

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

[CAS No.53940-82-2] $C_6H_{13}NO_2$ = 131.18





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

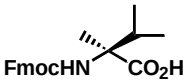
[CAS No.169566-81-8] $C_{21}H_{23}NO_4$ = 353.42

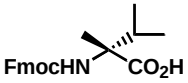
containing ≤10% Methyl *tert*-butyl ether (refrigerated transport)

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

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

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





α-Methyl-substituted-phenylalanines

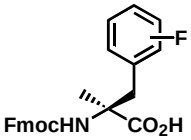
F-Phe

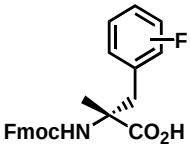
365442 **(*S*)- N-Fmoc-α-Methyl-2-fluorophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[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

[CAS No.1315449-93-4] $C_{25}H_{22}FNO_4$ = 419.45





410325 **(*S*)-α-Methyl-3-fluorophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 400

[CAS No.130855-56-0] $C_{10}H_{12}FNO_2$ = 197.21 5g $ 1,200

411825 **(*R*)-α-Methyl-3-fluorophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 400

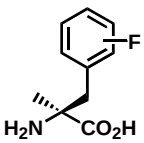
[CAS No. 1270184-80-9] $C_{10}H_{12}FNO_2$ = 197.21 5g $ 1,200

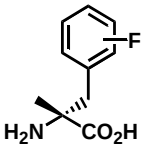
410133 **(*S*)-α-Methyl-4-fluorophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[CAS No.130855-57-1] $C_{10}H_{12}FNO_2$ = 197.21 5g $ 900

410132 **(*R*)-α-Methyl-4-fluorophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[CAS No. 422568-68-1] $C_{10}H_{12}FNO_2$ = 197.21 5g $ 900

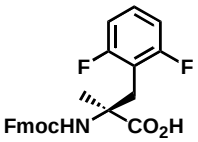




386761 **(*S*)- N-Fmoc-α-Methyl-2,6-difluorophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 400

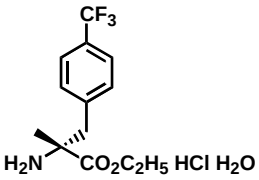
[CAS No.1223105-51-8] $C_{25}H_{21}F_2NO_4$ = 437.44

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



387097 **(*R*)-α-Methyl-4-trifluoromethylphenylalanine ethyl ester hydrochloride monohydrate** (≥ 98.0%, ≥ 98.0%ee)

[CAS No.1315449-99-0] $C_{13}H_{16}F_3NO_2 \cdot HCl \cdot H_2O = 329.75$ 1g $ 600

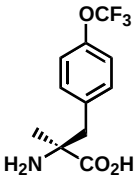


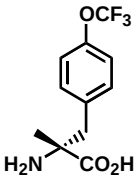
411843 **(*S*)-α-Methyl-4-trifluoromethoxyphenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 800

[CAS No. 1269926-90-0] $C_{11}H_{12}F_3NO_3 = 263.22$ 5g $ 3,200

410538 **(*R*)-α-Methyl-4-trifluoromethoxyphenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 800

[CAS No.1269835-58-6] $C_{11}H_{12}F_3NO_3 = 263.22$ 5g $ 3,200





Br-Phe

322899 **(*S*)-α-Methyl-2-bromophenylalanine·H₂O** (≥ 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·H₂O** (≥ 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·H₂O** (≥ 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·H₂O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

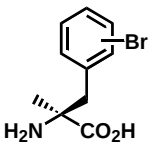
[CAS No.1212321-90-8] $C_{10}H_{12}BrNO_2 \cdot H_2O = 276.13$

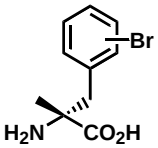
322900 **(*S*)-α-Methyl-4-bromophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 400

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

322897 **(*R*)-α-Methyl-4-bromophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 400

[CAS No.752971-41-8] $C_{10}H_{12}BrNO_2 = 258.11$





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

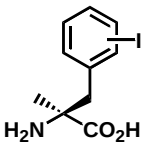
[CAS No.457652-83-4] $C_{10}H_{12}INO_2 \cdot H_2O$ = 323.13

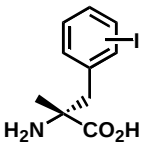
329206 **(*S*)-α-Methyl-4-iodophenylalanine** (≥ 98.0%, ≥ 98.0%ee) 1g $ 300

[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

[CAS No.1241680-71-6] $C_{10}H_{12}N_2O_4 \cdot H_2O$ = 242.23

333080 **(*R*)-α-Methyl-2-nitrophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 200

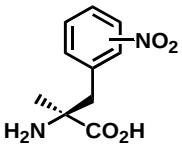
[CAS No.1241680-73-8] $C_{10}H_{12}N_2O_4 \cdot H_2O$ = 242.23

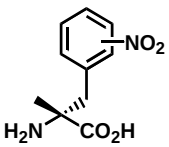
333078 **(*S*)-α-Methyl-3-nitrophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 200

[CAS No.1215092-14-0] $C_{10}H_{12}N_2O_4 \cdot H_2O$ = 242.23

333076 **(*R*)-α-Methyl-3-nitrophenylalanine·H_2O** (≥ 98.0%, ≥ 98.0%ee) 1g $ 200

[CAS No. 1215092-13-9] $C_{10}H_{12}N_2O_4 \cdot H_2O$ = 242.23

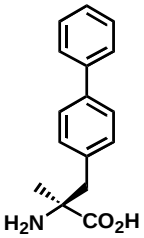




4-Ph-Phe

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

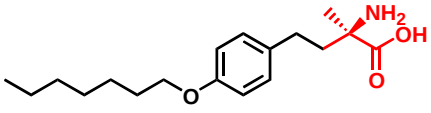


Application of Unnatural Amino Acids for Pharmaceuticals

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) increased chemical stability, 2) increased 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.

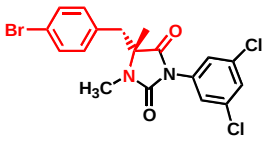
Tanaka, M. *Chem. Pharn. Bull.* **2007**, *55*, 349-358.

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



Chiral Analogue of Single S1P Receptor

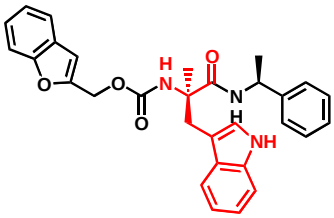
Albert, R. *et al*. *J. Med. Chem*. **2005**, *48*, 5373-5377.



Integrin ab-2 (LFA-1) Antagonist

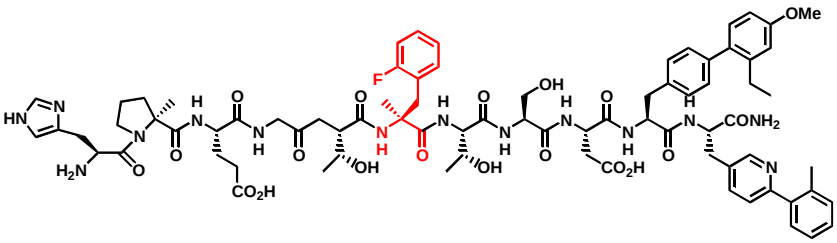
LFA-1/ICAM-1 Interaction Inhibitors

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



NK1 Receptor Antagonist

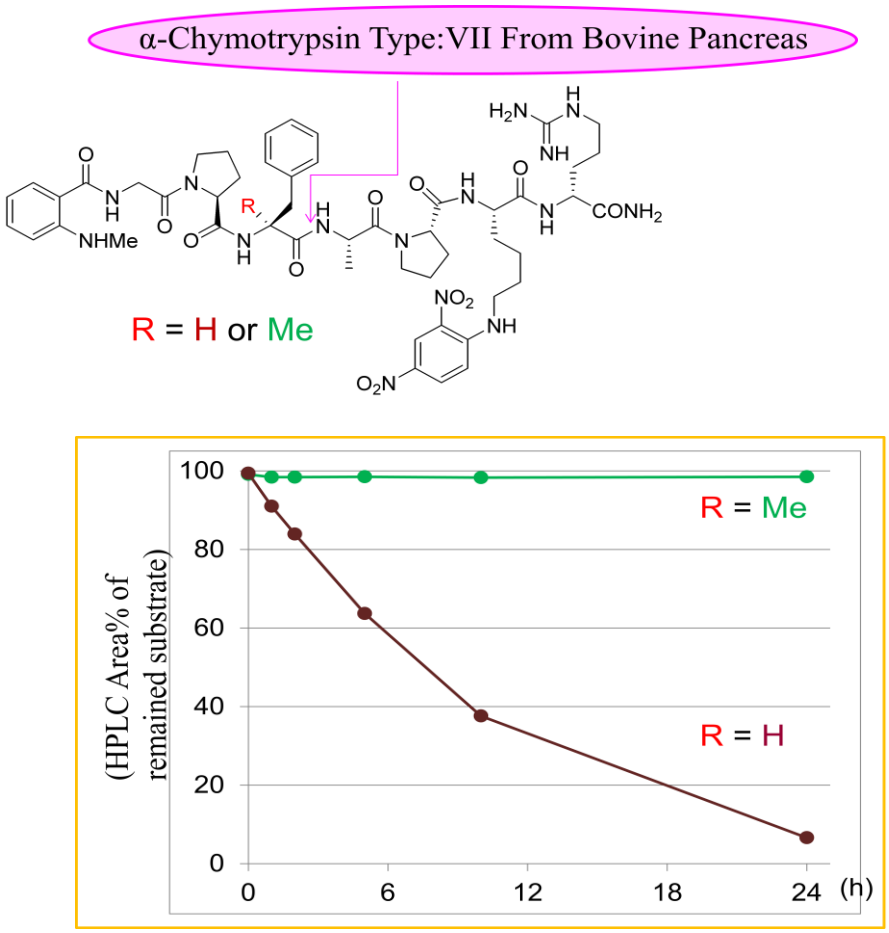
Boyle, S.et al. *Bioorganic & Medicinal Chemistry* **1994**, *2*, 357.



Glucagon –like Peptide-1 Receptor Agonist with Antidiabetic Activity

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

Resistance of a Peptide with α,α-disubstituted Amino Acid against Protease



Incubated at 30 deg in 10% DMSO/0.1 M Pi buffer (pH=8.0) solution

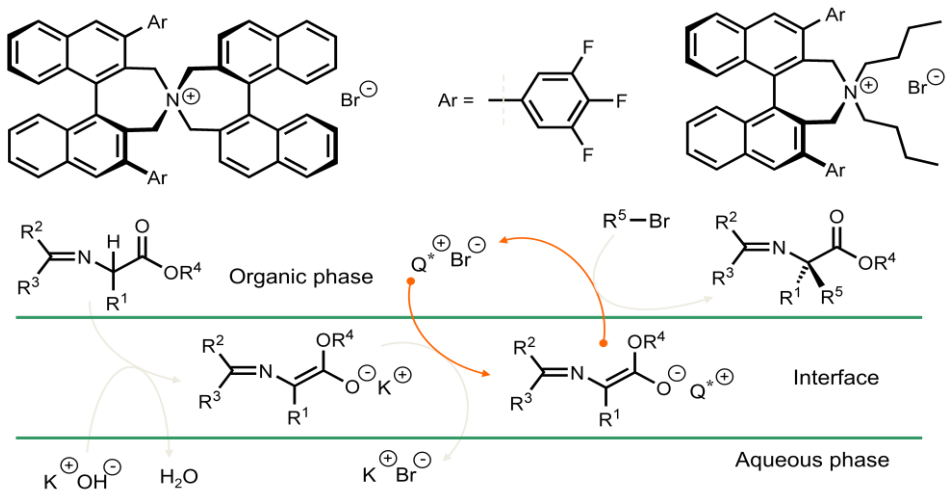
A tryptic digestion assay of α-methyl phenylalanine-containing peptide was carried out to investigate the effect of α,α-dialkylamino acid residue on the protease resistance. The introduction of α,α-dialkylamino acid residue (alpha-Methylphenylalanine) to the peptide backbone exhibited higher protease resistance in 24 hours than the peptide with α-monoalkyl amino acid (phenylalanine). The peptide with the α,α-dialkylamino acid residue resulted in complete resistance.

Reference:

Matsuyama, K.; Yamamoto, K.; Murakami, S.; Anzai, K. Construction of an unnatural amino acids library through asymmetric alkylation of glycine or alanine ester Shiff-base utilizing Maruoka Catalyst®.

Presented at the 5th International Peptide Symposium, Kyoto, Japan, December 4-9, 2010; P2-204.

Asymmetric Phase-Transfer Reaction with Maruoka Catalyst® to Synthesize 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**)

According to the Maruoka interfacial mechanism, protected α-amino acid is converted into the potassium *E*-enolate. And because of the lipophilic nature of the quaternary ammonium salt, it can move more easily and frequently into the interface layar where cation exchange takes place with the potassium *E*-enolate. And as the si face of the *E*-enolate is shielded by the molecular cavity of the catalyst, an alkyl halide is only allowed to approach the re face of the enolate.

This is the reason why Maruoka Catalyst® shows high reactivity and selectivitiy.

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	6,340,753; 6,441,231; 7,928,224; 8,252,962
JP	4,217,085; 4,502,293; 4,605,606; 5,106,562; 5,108,777; 5,108,888
SG	139,249
IN	252,017
CN	ZL200680027800.6

Trade mark

Maruoka Catalyst is the registered trade mark in US, EU.

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Mission: 'Maintain Good and Fair Business Practice'

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