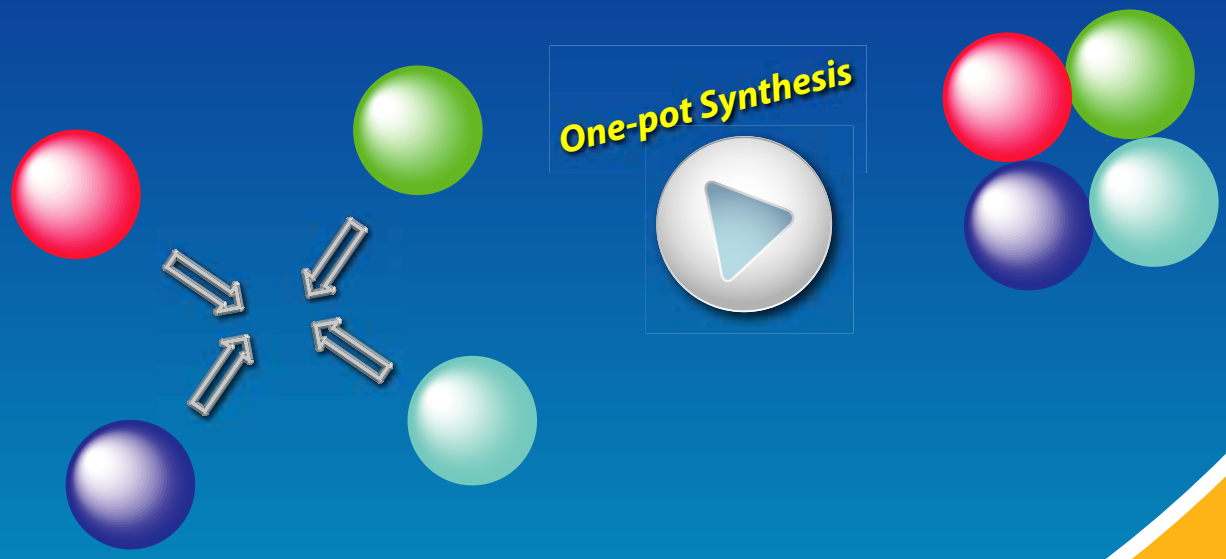
CHEMISTRY

多组分反应 (MCR)

Multicomponent Reaction (MCR)



- 醛类
- 胺类
- 羧酸类
- β-酮酸酯类
- 异腈类
- 脲类
- 硫脲类
- 亚磷酸二烷基酯类
- 苯炔前体类
- Lewis酸类
- 离子液体类

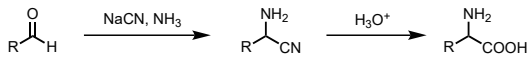
多组分反应 (MCR)

多组分反应（MCR），就是将三种或更多的反应物一起放入一个反应器中来制备新产品的合成方法。MCR的特点是最终产物的结构中几乎包含了底物的所有片段，反应过程中基本无副产物生成。这使得MCR成为一种极其理想且环境友好的反应体系。目标产物能够在反应步骤更少的一锅法中制备得到。因此，MCR已经在各研究领域中受到瞩目的关注，例如药物化学中的先导化合物的探索，或者组合化学中的研究等。

目前关于MCR的报道已有很多，其中典型案例如下所述。

1. Strecker反应 (三组分反应: 3CR)

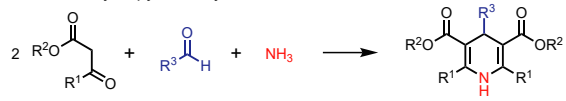
Strecker Reaction (Amino Acid Synthesis)



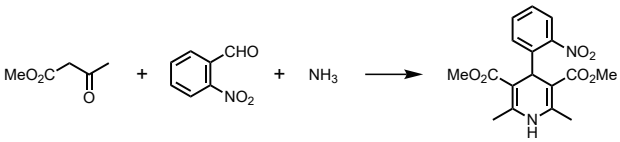
这一反应由A. Strecker报道于1850年，是一种极有名的制备α-氨基酸的合成方法。该反应由醛、氰化氢和氨三种组分作为底物，被认为是世界上首个MCR[1]。

2. Hantzsch二氢吡啶合成 (3CR)

Hantzsch Dihydropyridine Synthesis



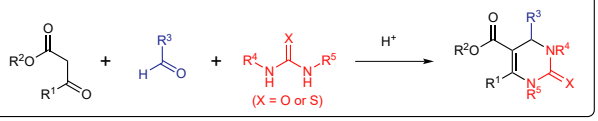
这一反应由A. R. Hantzsch报道于1881年，是最著名的三组分MCR，反应使用β-酮酸酯、醛和氨生成1,4-二氢吡啶衍生物[2]。例如，一种钙通道阻滞剂——“硝苯地平(Nifedipine)”，就是通过这个反应制备得到的[3]。



Nifedipine

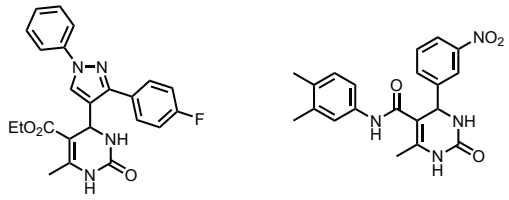
3. Biginelli反应 (3CR)

Biginelli reaction



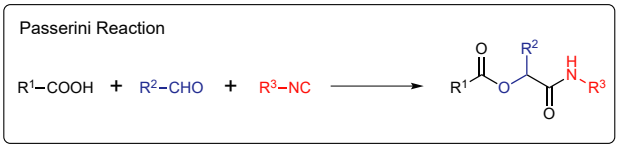
1891年，意大利化学家P. Biginelli，报道了一种三组分MCR：在酸催化剂 (Brönsted或Lewis酸)存在下，β-酮酸酯如乙酰乙酸乙酯[A0649]、芳醛如苯甲醛[B2379]，和脲 (或硫脲)发生反应生成二氢嘧啶酮衍生物[4]。由于具有抗炎或抗菌等各种生物活性，二氢嘧啶酮类化合物已受到许多关注。例如使用该反应研发出的几种抗结核药物如下所示[5]。

Examples of Anti-tubercular Agents using Biginelli Reaction

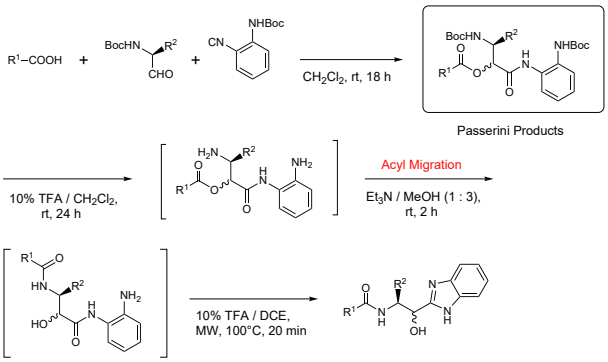


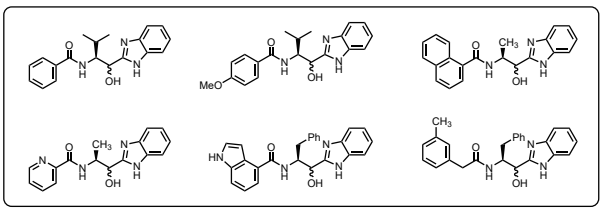
4. Passerini反应 (3CR)

Passerini Reaction

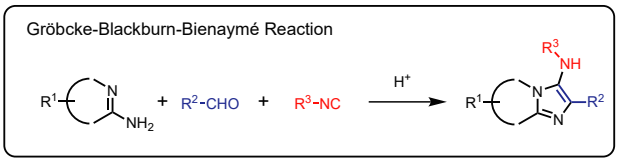


1921年，意大利化学家M. Passerini等报道了使用羧酸、醛和异腈制备α-酰氧基酰胺类化合物的三组分反应[6]。这个Passerini反应也可用于药物研究中，例如，Hulme等报道了含有苯并咪唑基团的新型去甲他汀类衍生物的库合成[7]。

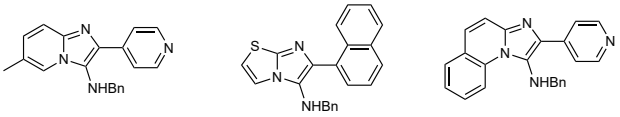




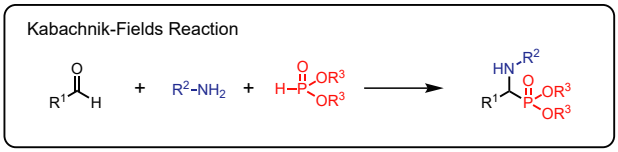
5. Gröbcke-Blackburn-Bienaymé反应 (3CR)



Gröbcke-Blackburn-Bienaymé反应[8]是在酸催化剂存在下，醛、异腈和2-氨基咪唑或2-氨基吡啶等α-氨基吖嗪类化合物的三组分MCR。该反应用于稠合含氮芳香族化合物的合成(如下图所示)。

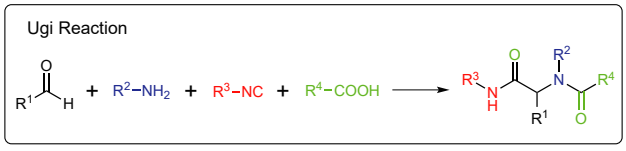


6. Kabachnik-Fields反应 (3CR)

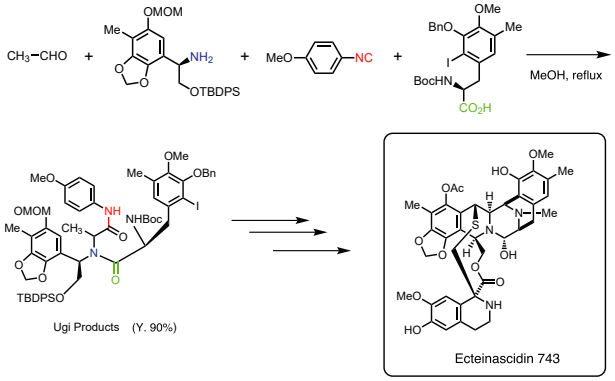


1952年，M. I. Kabachinik等报道了酸催化剂(Brønsted或Lewis酸)存在下，醛、胺和亚磷酸二烷基酯的三组分MCR，生成α-氨基磷酸酯[9]。近年来，α-氨基磷酸酯由于被认为是相应α-氨基酸和多肽水解过程中的过渡态模拟的结构类似物而备受关注，因此被用于诸多研究领域，如肾素抑制剂或HIV蛋白酶抑制剂的开发[10]。

7. Ugi反应 (4CR)



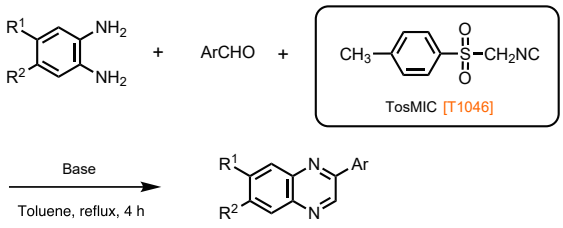
1962年I.K.Ugi等首次报道了该四组分MCR[11]。它能够使四种组分(醛、胺、异腈和羧酸)发生一锅法缩合反应，因此，可以说Ugi反应是最通用的MCR。例如，Fukuyama等报道了一种来自海洋被囊动物中的具有极高抗肿瘤活性的海鞘素743的合成，Ugi反应作为关键步骤[12]，如下所示：



其他MCR的例子

●使用对甲基苯磺酰甲基异腈(TosMIC)的MCR (3CR)

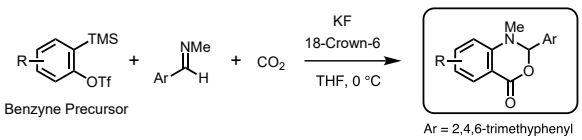
由Leusen等研发出的对甲基苯磺酰甲基异腈(TosMIC)[T1046]是一种合成试剂，其分子中同时含有异氰基和甲基磺酰基 (离去基团)[13]。与其它具有特殊气味的异腈类化合物不同，TosMIC是一种无味的固体化合物。由于易于操作，它被广泛用于噁唑类等含氮芳香杂环化合物的合成[14]。此外，TosMIC也可用于MCR中，例如，Tsoleridis等人报道了邻苯二胺、芳醛和TosMIC的三组分缩合反应来制备得到喹喔啉衍生物[15]。



Entry	R^1	R^2	Ar	Base	Quinoxaline (Y. %)
1	H	H	phenyl	DABCO	91
2	H	H	2,4-dimethylphenyl	DABCO	81
3	H	H	4-chlorophenyl	DABCO	84
4	Me	Me	phenyl	DBU	86
5	Me	Me	2-methylphenyl	DBU	85

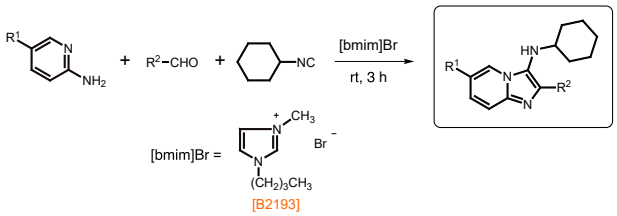
●使用苯炔的MCR (3CR)

最近，也有一些使用苯炔的MCR见诸报道。例如，Yoshida等报道了由原位生成的苯炔、亚胺和二氧化碳生成苯并噁嗪酮类化合物的三组分MCR[16]。从生态角度来看，使用二氧化碳作为碳源的有机合成近年来也备受关注。因此，上述反应是一种极其有用且环境友好的MCR。



Benzyne Precursor	Reaction time (h)	Product
TMS, OTf [T2089]	15	(Y. 82%)
F, TMS, OTf	63	F and (Y. 63%, 4 : 1)
OMe, TMS, OTf [M1884]	46	OMe (Y. 73%)
TMS, OTf [T2466]	60	(Y. 44%)

因此，MCR是一种使多种底物在一锅中进行缩合的强有力的合成方法。但有时，即使已经对溶剂或Lewis酸催化剂等反应条件进行过优化，反应依旧需要很长的时间才能完成，或者产生副反应。对于这些问题的解决，已经有一些成功改进MCR的报道。例如，Shaabani等报道了离子液体促进下的Gröbcke-Blackburn-Bienaymé反应[17]。如下表所示，在使用离子液体作为溶剂的案例中，反应能够顺利进行，且产率比较高。然而，在未使用离子液体的情况下，即使延长反应时间，产品的产率也很低 (Entry 2')。此外，如Entry 1中所示，离子液体能够在同样的反应中再次使用，且保持高产率。



Entry	R^1	R^2	Yield (%)
1	Br	Ph	98 (95, 92, 90, 85) [a]
2	Me	Ph	98
2' [b]	Me	Ph	25
3	Me	4-$CH_3C_6H_4$	99
4	Me	4-$O_2NC_6H_4$	92
5	Me	4-Pyridyl	97

[a] The same ionic liquid is used for each of the five runs.
[b] Ionic liquid is not used. Reaction time is 12 h.

离子液体一般能够得到回收和重复利用，这有利于减少使用传统溶剂的浪费，这些传统溶剂一般很少再次使用。此外，由于挥发性低，离子液体作为良好的反应溶剂而备受关注。根据这些方面判断，这个反应可以认作是一种更加环境友好的反应案例。

TCI能够稳定提供各种用于MCR中的醛、胺、羧酸、β-酮酸酯、脲 & 硫脲以及亚磷酸二烷基酯类化合物。基于目前关于MCR的报告，我们挑选并且列出了典型的醛、胺和羧酸类化合物。此外，用于MCR中的苯炔前体、Lewis酸和离子液体等产品也在本手册中列出。

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醛类
Aldehydes

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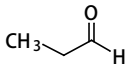
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CAS RN: 123-38-6

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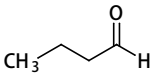
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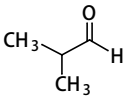
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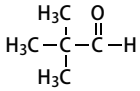
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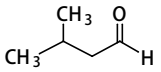
Isovaleraldehyde
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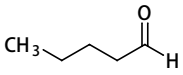
V0001 25mL 500mL

Valeraldehyde
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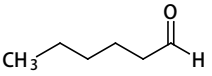
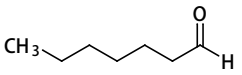
H0133 25mL 100mL 500mL

Hexanal
CAS RN: 66-25-1

H0025 25mL 500mL

Heptanal
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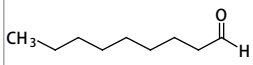
Nonanal
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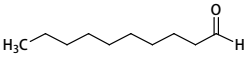
Decanal
CAS RN: 112-31-2

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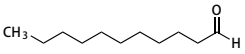
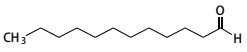
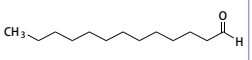
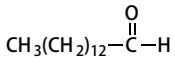
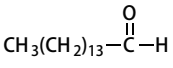
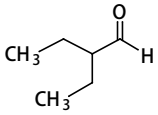

Undecanal
CAS RN: 112-44-7

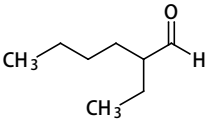
D0979 25mL 500mL

Dodecanal (stabilized with DL-α-Tocopherol)
CAS RN: 112-54-9

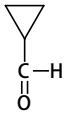
T0410 5mL

Tridecanal
CAS RN: 10486-19-8

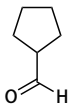
T2696 1g

Tetradecanal
CAS RN: 124-25-4

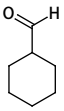
P1869 1g

Pentadecanal
CAS RN: 2765-11-9

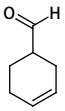
E0069 25mL 100mL 500mL

2-Ethylbutyraldehyde
CAS RN: 97-96-1

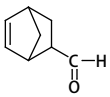
E0125 25mL 500mL

2-Ethylhexanal
CAS RN: 123-05-7

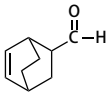
C1707 1g 5g

Cyclopropanecarboxaldehyde
CAS RN: 1489-69-6

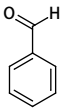
C3019 1mL 5mL

Cyclopentanecarboxaldehyde
(stabilized with HQ)
CAS RN: 872-53-7

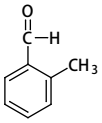
C0880 25mL 100mL

Cyclohexanecarboxaldehyde
CAS RN: 2043-61-0

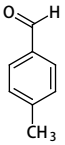
C0881 25mL

3-Cyclohexene-
1-carboxaldehyde
CAS RN: 100-50-5

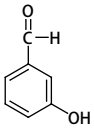
N0504 5mL 25mL

5-Norbornene-
2-carboxaldehyde
CAS RN: 5453-80-5

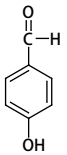
B5279 200mg 1g

Bicyclo[2.2.2]oct-5-ene-
2-carboxaldehyde
CAS RN: 38259-00-6

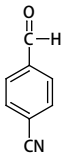
B2379 500g

Benzaldehyde
CAS RN: 100-52-7

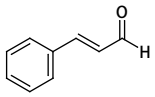
T0566 25g 100g 500g

o-Tolualdehyde
CAS RN: 529-20-4

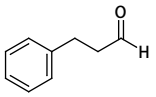
T0259 25mL 100mL 500mL

p-Tolualdehyde
CAS RN: 104-87-0

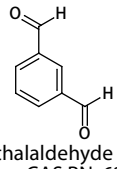
H0197 25g 100g 500g

3-Hydroxybenzaldehyde
CAS RN: 100-83-4

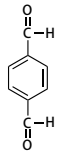
H0198 25g 100g 500g

4-Hydroxybenzaldehyde
CAS RN: 123-08-0

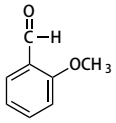
C0443 5g 25g

4-Cyanobenzaldehyde
CAS RN: 105-07-7

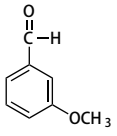
C0352 25mL 500mL

trans-Cinnamaldehyde
CAS RN: 14371-10-9

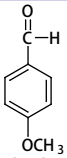
P0217 25g 100g

3-Phenylpropionaldehyde
CAS RN: 104-53-0

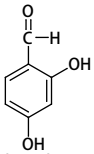
I0153 25g 100g 250g

Isophthalaldehyde
CAS RN: 626-19-7

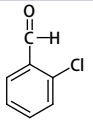
T0010 25g 100g 500g

Terephthalaldehyde
CAS RN: 623-27-8

A0479 25g 100g 500g

o-Anisaldehyde
CAS RN: 135-02-4

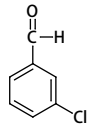
A0478 25mL 100mL 500mL

m-Anisaldehyde
CAS RN: 591-31-1

A0480 25mL 500mL

p-Anisaldehyde
CAS RN: 123-11-5

D0564 25g 100g 500g

2,4-Dihydroxybenzaldehyde
CAS RN: 95-01-2

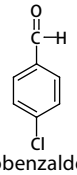
C0561 25g 500g

2-Chlorobenzaldehyde
CAS RN: 89-98-5

C0124 25g 100g 500g



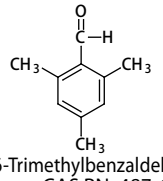
3-Chlorobenzaldehyde
CAS RN: 587-04-2

C0125 25g 100g 500g



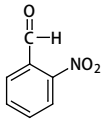
4-Chlorobenzaldehyde
CAS RN: 104-88-1

T1368 25mL



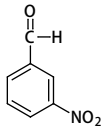
2,4,6-Trimethylbenzaldehyde
CAS RN: 487-68-3

N0130 25g 100g 500g



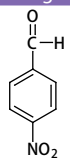
2-Nitrobenzaldehyde
CAS RN: 552-89-6

N0129 25g 100g 500g



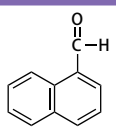
3-Nitrobenzaldehyde
CAS RN: 99-61-6

N0559 25g 100g 500g



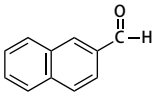
4-Nitrobenzaldehyde
CAS RN: 555-16-8

N0002 25mL 100mL 500mL



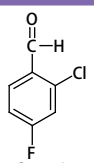
1-Naphthaldehyde
CAS RN: 66-77-3

N0003 5g 25g



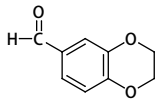
2-Naphthaldehyde
CAS RN: 66-99-9

C1465 1g 5g



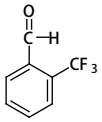
2-Chloro-4-fluorobenzaldehyde
CAS RN: 84194-36-5

B2019 1g 5g



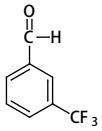
3,4-Ethylenedioxy-
benzaldehyde
CAS RN: 29668-44-8

T1281 25g



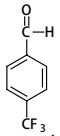
2-(Trifluoromethyl)-
benzaldehyde
CAS RN: 447-61-0

T1399 5g 25g



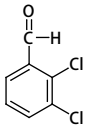
3-(Trifluoromethyl)-
benzaldehyde
CAS RN: 454-89-7

T1091 5g 25g 250g



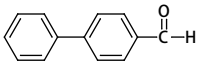
4-(Trifluoromethyl)-
benzaldehyde
CAS RN: 455-19-6

D1666 25g 500g



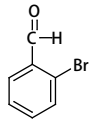
2,3-Dichlorobenzaldehyde
CAS RN: 6334-18-5

B0242 5g 25g 250g



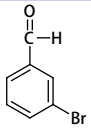
4-Phenylbenzaldehyde
CAS RN: 3218-36-8

B0836 25g 100g 500g



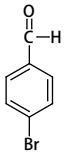
2-Bromobenzaldehyde
CAS RN: 6630-33-7

B0548 25g 100g 500g



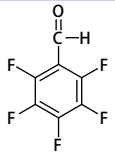
3-Bromobenzaldehyde
CAS RN: 3132-99-8

B0549 25g 250g



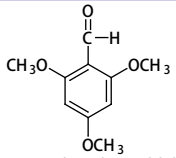
4-Bromobenzaldehyde
CAS RN: 1122-91-4

P0746 5g 25g



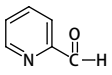
Pentafluorobenzaldehyde
CAS RN: 653-37-2

T2651 5g 25g



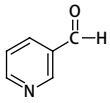
2,4,6-Trimethoxybenzaldehyde
CAS RN: 830-79-5

P0425 25g 100g 500g



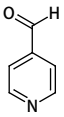
2-Pyridinecarboxaldehyde
CAS RN: 1121-60-4

N0090 25mL 100mL



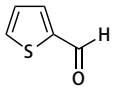
3-Pyridinecarboxaldehyde
CAS RN: 500-22-1

I0143 25mL 500mL



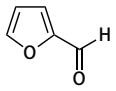
4-Pyridinecarboxaldehyde
CAS RN: 872-85-5

T0725 25mL 100mL 500mL



2-Thiophenecarboxaldehyde
(stabilized with HQ)
CAS RN: 98-03-3

F0073 25g 500g



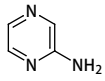
Furfural
CAS RN: 98-01-1

胺类
Amines

P0911 5mL 25mL

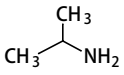
Propargylamine
CAS RN: 2450-71-7

A0989 5g 25g



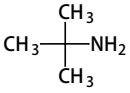
2-Aminopyrazine
CAS RN: 5049-61-6

I0165 25mL 500mL



Isopropylamine
CAS RN: 75-31-0

B0709 25mL 100mL 500mL

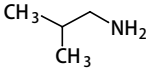


tert-Butylamine
CAS RN: 75-64-9

B0707 25mL 500mL

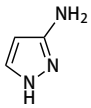
Butylamine
CAS RN: 109-73-9

I0095 25mL 500mL



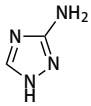
Isobutylamine
CAS RN: 78-81-9

A1859 5g 25g



3-Aminopyrazole
CAS RN: 1820-80-0

A0432 25g 100g 500g

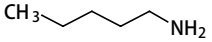


3-Amino-1,2,4-triazole
CAS RN: 61-82-5

C0887 25mL 500mL

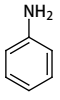
Cyclopentylamine
CAS RN: 1003-03-8

A0445 25mL 100mL 500mL



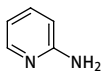
Amylamine
CAS RN: 110-58-7

A0463 500g



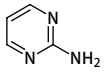
Aniline
CAS RN: 62-53-3

A0411 25g 100g 500g



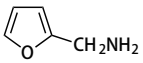
2-Aminopyridine
CAS RN: 504-29-0

A0412 25g



2-Aminopyrimidine
CAS RN: 109-12-6

F0091 25mL 100mL 500mL

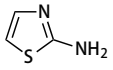


Furfurylamine
CAS RN: 617-89-0

C0494 25mL 500mL

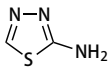
Cyclohexylamine
CAS RN: 108-91-8

A0633 25g 100g 500g



2-Aminothiazole
CAS RN: 96-50-4

A1060 5g 25g

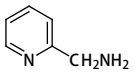


2-Amino-1,3,4-thiadiazole
CAS RN: 4005-51-0

B0406 25mL 500mL

Benzylamine
CAS RN: 100-46-9

A1161 25g 250g

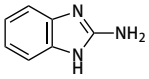


2-Picolylamine
CAS RN: 3731-51-9

B0541 25g 250g

2-Bromoaniline
CAS RN: 615-36-1

A0850 5g 25g



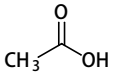
2-Aminobenzimidazole
CAS RN: 934-32-7

羧酸类
Carboxylic Acids

F0513 300mL

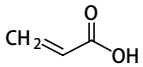
Formic Acid
CAS RN: 64-18-6

A2035 300mL



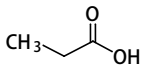
Acetic Acid
CAS RN: 64-19-7

A0141 25g 500g



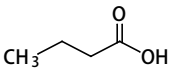
Acrylic Acid
(stabilized with MEHQ)
CAS RN: 79-10-7

P0500 25mL 500mL



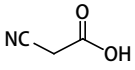
Propionic Acid
CAS RN: 79-09-4

B0754 25mL 500mL



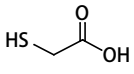
Butyric Acid
CAS RN: 107-92-6

C0439 25g 500g



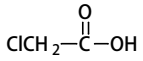
Cyanoacetic Acid
CAS RN: 372-09-8

M0052 25g 500g



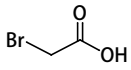
Thioglycolic Acid
CAS RN: 68-11-1

C2123 25g 500g



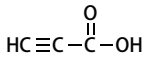
Chloroacetic Acid
CAS RN: 79-11-8

B0531 25g 500g



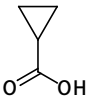
Bromoacetic Acid
CAS RN: 79-08-3

P0497 5g 25g



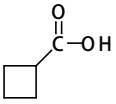
Propiolic Acid
CAS RN: 471-25-0

C0387 25mL 100mL 500mL



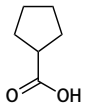
Cyclopropanecarboxylic Acid
CAS RN: 1759-53-1

C0888 10g 25g



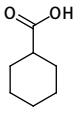
Cyclobutanecarboxylic Acid
CAS RN: 3721-95-7

C0512 5g 25g



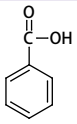
Cyclopentanecarboxylic Acid
CAS RN: 3400-45-1

C0470 25g 500g



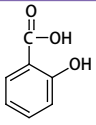
Cyclohexanecarboxylic Acid
CAS RN: 98-89-5

B2635 25g 500g



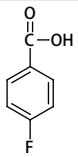
Benzoic Acid
CAS RN: 65-85-0

H0206 25g 500g



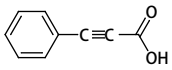
2-Hydroxybenzoic Acid
CAS RN: 69-72-7

F0112 25g



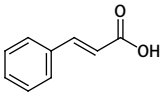
4-Fluorobenzoic Acid
CAS RN: 456-22-4

P0610 5g 25g



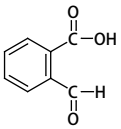
Phenylpropiolic Acid
CAS RN: 637-44-5

C0353 25g 100g 500g



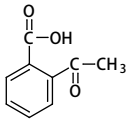
trans-Cinnamic Acid
CAS RN: 140-10-3

P0281 25g 100g 500g



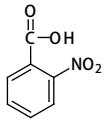
Phthalaldehydic Acid
CAS RN: 119-67-5

A1075 5g 25g



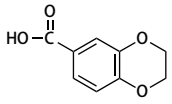
2-Acetylbenzoic Acid
CAS RN: 577-56-0

N0155 25g 500g



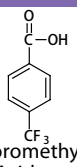
2-Nitrobenzoic Acid
CAS RN: 552-16-9

B3764 5g 25g



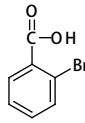
1,4-Benzodioxane-
6-carboxylic Acid
CAS RN: 4442-54-0

T1145 5g 25g



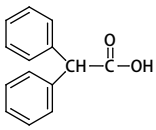
4-(Trifluoromethyl)-
benzoic Acid
CAS RN: 455-24-3

B0552 25g 100g 500g



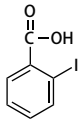
2-Bromobenzoic Acid
CAS RN: 88-65-3

D0869 25g 100g 500g



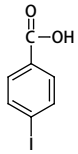
Diphenylacetic Acid
CAS RN: 117-34-0

I0053 25g 100g 500g



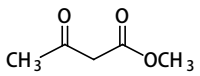
2-Iodobenzoic Acid
CAS RN: 88-67-5

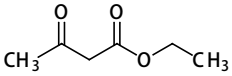
I0054 5g 25g

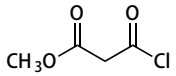


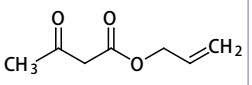
4-Iodobenzoic Acid
CAS RN: 619-58-9

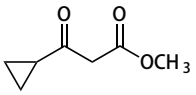
β-酮酸酯类
β-Keto Esters

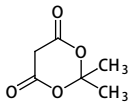
A0650 25g 500g

Methyl Acetoacetate
CAS RN: 105-45-3

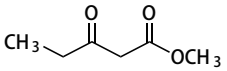
A0649 25g 500g

Ethyl Acetoacetate
CAS RN: 141-97-9

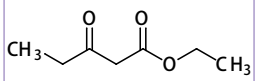
M2315 5g 25g

Methyl Malonyl Chloride
CAS RN: 37517-81-0

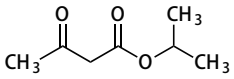
A1981 25g 500g

Allyl Acetoacetate
CAS RN: 1118-84-9

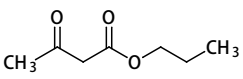
M2277 5g 25g

Methyl 3-Cyclopropyl-3-oxopropionate
CAS RN: 32249-35-7

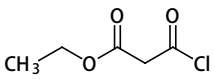
M0799 25g 100g 500g

Meldrum's Acid (=2,2-Dimethyl-1,3-dioxane-4,6-dione)
CAS RN: 2033-24-1

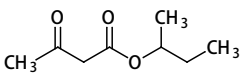
K0035 25g 100g 500g

Methyl 3-Oxovalerate
CAS RN: 30414-53-0

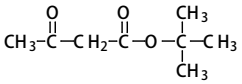
K0031 5g 25g

Ethyl 3-Oxovalerate
CAS RN: 4949-44-4

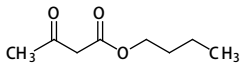
I0826 25g 500g

Isopropyl Acetoacetate
CAS RN: 542-08-5

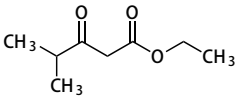
A0817 25mL 500mL

Propyl Acetoacetate
CAS RN: 1779-60-8

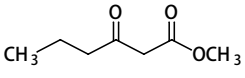
E0484 5g 25g

Ethyl Malonyl Chloride
CAS RN: 36239-09-5

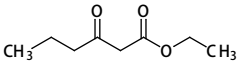
A0815 25mL

sec-Butyl Acetoacetate
CAS RN: 13562-76-0

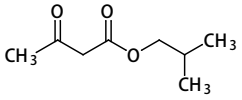
A0816 25mL 100mL 500mL

tert-Butyl Acetoacetate
CAS RN: 1694-31-1

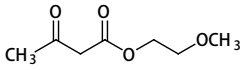
A0795 25mL

Butyl Acetoacetate
CAS RN: 591-60-6

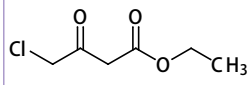
E0882 5g 25g

Ethyl Isobutyrylacetate
CAS RN: 7152-15-0

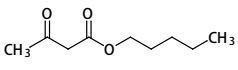
K0037 25mL 500mL

Methyl 3-Oxohexanoate
CAS RN: 30414-54-1

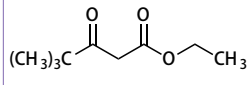
K0030 25mL 500mL

Ethyl 3-Oxohexanoate
CAS RN: 3249-68-1

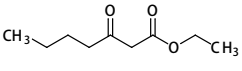
A0814 25mL 500mL

Isobutyl Acetoacetate
CAS RN: 7779-75-1

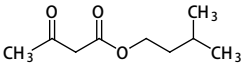
A1583 25g 500g

2-Methoxyethyl Acetoacetate
CAS RN: 22502-03-0

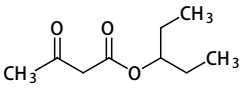
C0911 25g 500g

Ethyl 4-Chloroacetoacetate
CAS RN: 638-07-3

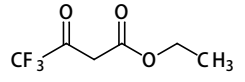
A0811 25mL 500mL

Amyl Acetoacetate
CAS RN: 6624-84-6

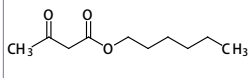
D1891 5mL 25mL

Ethyl 4,4-Dimethyl-3-oxovalerate
CAS RN: 17094-34-7

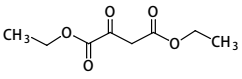
O0216 10g 25g

Ethyl 3-Oxoheptanoate
CAS RN: 7737-62-4

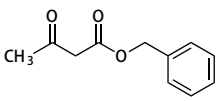
A0812 25mL 500mL

Isoamyl Acetoacetate
CAS RN: 2308-18-1

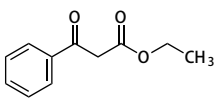
A0813 25mL

3-Pentyl Acetoacetate
CAS RN: 13562-81-7

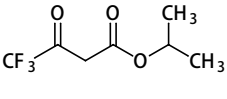
T0810 25g 100g 500g

Ethyl 4,4,4-Trifluoroacetoacetate
CAS RN: 372-31-6

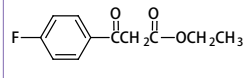
A0913 25mL

Hexyl Acetoacetate
CAS RN: 13562-84-0

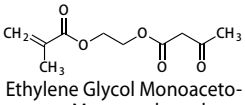
O0073 5g 25g

Diethyl Oxalacetate
CAS RN: 108-56-5

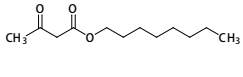
A1080 25mL 100mL 500mL

Benzyl Acetoacetate
CAS RN: 5396-89-4

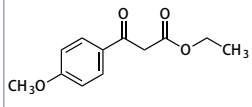
B0097 25g 100g 500g

Ethyl Benzoylacetate
CAS RN: 94-02-0

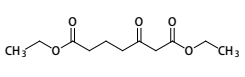
T1530 25g

Isopropyl 4,4,4-Trifluoroacetoacetate
CAS RN: 175230-50-9

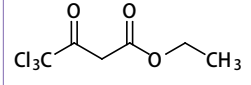
F0435 1g 5g 25g

Ethyl (4-Fluorobenzoyl)acetate
CAS RN: 1999-00-4

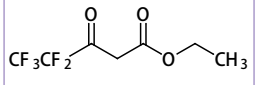
E0489 25g 500g

Ethylene Glycol Monoacetoacetate Monomethacrylate
(stabilized with BHT)
CAS RN: 21282-97-3

A0915 25mL

n-Octyl Acetoacetate
CAS RN: 16436-00-3

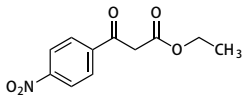
M1380 5g 25g

Ethyl 4-Methoxybenzoylacetate
CAS RN: 2881-83-6

O0229 1g 5g

Diethyl 3-Oxopimelate
CAS RN: 40420-22-2

T1285 10g 25g

Ethyl 4,4,4-Trichloroacetoacetate
CAS RN: 3702-98-5

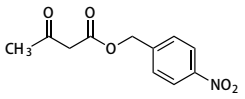
P1062 5g

Ethyl 4,4,5,5,5-Pentafluoro-3-oxovalerate
CAS RN: 663-35-4

N0513 5g 25g



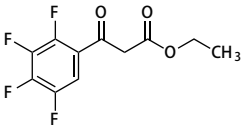
Ethyl 4-Nitrobenzoylacetate
CAS RN: 838-57-3

N0875 5g 25g



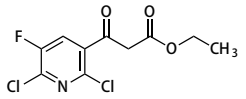
4-Nitrobenzyl Acetoacetate
CAS RN: 61312-84-3

E0759 25g



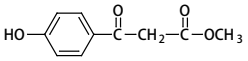
Ethyl (2,3,4,5-Tetrafluoro-benzoyl)acetate
CAS RN: 94695-50-8

E0811 5g 25g



Ethyl 3-(2,6-Dichloro-5-fluoro-3-pyridyl)-3-oxopropionate
CAS RN: 96568-04-6

H0828 1g 5g



Methyl (4-Hydroxybenzoyl)-acetate
CAS RN: 32066-29-8

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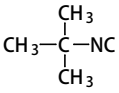
Isonitriles

B1274 5mL 25mL

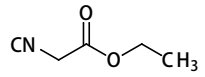


tert-Butyl Isocyanide
CAS RN: 7188-38-7

C1438 1g 5g

Cyclohexyl Isocyanide
CAS RN: 931-53-3

I0562 5g 25g

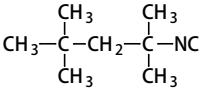


Ethyl Isocyanoacetate
CAS RN: 2999-46-4

B2185 1g 5g

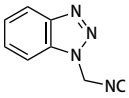
Benzyl Isocyanide
CAS RN: 10340-91-7

T1054 1mL 5mL



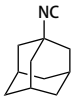
1,1,3,3-Tetramethylbutyl Isocyanide
CAS RN: 14542-93-9

I0455 1g 5g



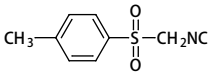
1(1*H*-Benzotriazol-1-yl)-methyl Isocyanide
CAS RN: 87022-42-2

I0824 1g 5g



1-Adamantyl Isocyanide
CAS RN: 22110-53-8

T1046 5g 25g



p-Toluenesulfonylmethyl Isocyanide (= TosMIC)
CAS RN: 36635-61-7

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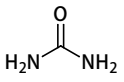
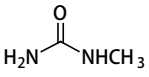
Ureas

U0073 300g



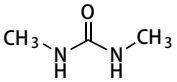
Urea
CAS RN: 57-13-6

M0455 25g 500g



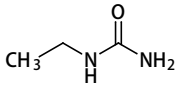
1-Methylurea
CAS RN: 598-50-5

D0289 25g 500g



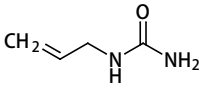
1,3-Dimethylurea
CAS RN: 96-31-1

E0192 25g 500g



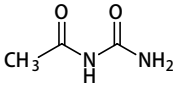
Ethylurea
CAS RN: 625-52-5

A0237 25g



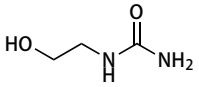
Allylurea
CAS RN: 557-11-9

A0124 25g



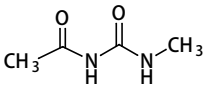
Acetylurea
CAS RN: 591-07-1

H0700 25g



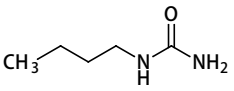
2-Hydroxyethylurea
CAS RN: 2078-71-9

A0101 25g



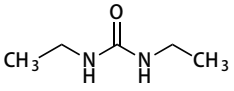
1-Acetyl-3-methylurea
CAS RN: 623-59-6

B1831 25g



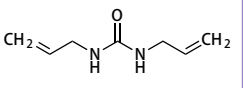
Butylurea
CAS RN: 592-31-4

D0534 25g 500g



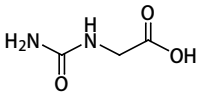
1,3-Diethylurea
CAS RN: 623-76-7

D5170 1g 5g



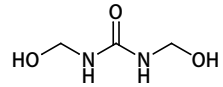
1,3-Diallylurea
CAS RN: 1801-72-5

H0655 25g



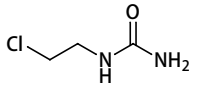
N-Carboxymethylurea
CAS RN: 462-60-2

D0767 25g 500g



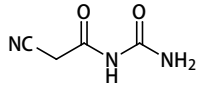
1,3-Bis(hydroxymethyl)-urea
CAS RN: 140-95-4

C0173 25g



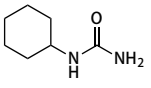
2-Chloroethylurea
CAS RN: 6296-42-0

C1101 25g 250g



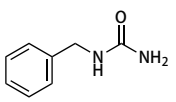
Cyanoacetylurea
CAS RN: 1448-98-2

C2034 25g



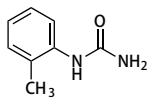
Cyclohexylurea
CAS RN: 698-90-8

B0449 25g



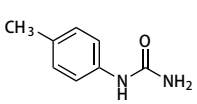
Benzylurea
CAS RN: 538-32-9

T0802 25g



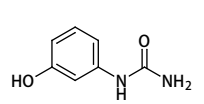
o-Tolylurea
CAS RN: 614-77-7

T0328 25g



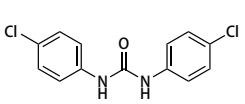
p-Tolylurea
CAS RN: 622-51-5

H0438 25g



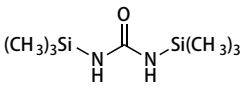
3-Hydroxyphenylurea
CAS RN: 701-82-6

B4529 1g 5g



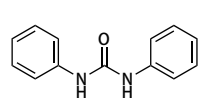
1,3-Bis(4-chlorophenyl)urea
CAS RN: 1219-99-4

B1103 25g



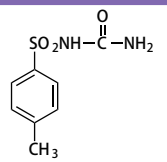
N,*N*'-Bis(trimethylsilyl)urea
CAS RN: 18297-63-7

C0031 25g 100g 500g



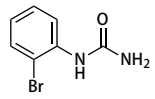
1,3-Diphenylurea
CAS RN: 102-07-8

T2890 5g



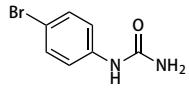
p-Toluenesulfonylurea
CAS RN: 1694-06-0

B2833 5g



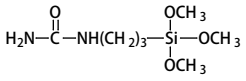
(2-Bromophenyl)urea
CAS RN: 13114-90-4

B2834 5g 25g



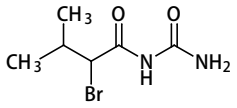
(4-Bromophenyl)urea
CAS RN: 1967-25-5

T1915 25g 250g



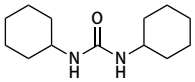
1-[3-(Trimethoxysilyl)-propyl]urea
CAS RN: 23843-64-3

B2842 25g



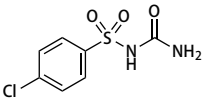
1-(2-Bromoisovaleryl)urea
CAS RN: 496-67-3

D0441 25g 100g 500g



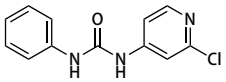
1,3-Dicyclohexylurea
CAS RN: 2387-23-7

C2266 5g



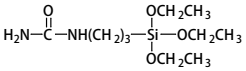
(4-Chlorophenylsulfonyl)-urea
CAS RN: 22663-37-2

C0926 5g



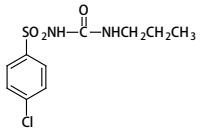
1-(2-Chloro-4-pyridyl)-3-phenylurea
CAS RN: 68157-60-8

U0048 25mL 500mL



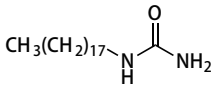
1-[3-(Triethoxysilyl)propyl]-urea (40-52% in Methanol)
CAS RN: 23779-32-0

C1220 25g



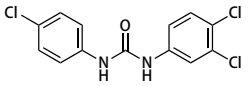
1-(4-Chlorophenylsulfonyl)-3-propylurea
CAS RN: 94-20-2

O0209 10g



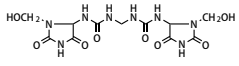
N-Octadecylurea
CAS RN: 2158-08-9

T1015 25g 500g



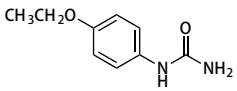
3,4,4'-Trichlorodiphenylurea
CAS RN: 101-20-2

I0665 25g 250g



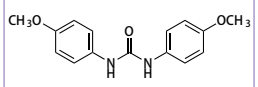
Imidazolidinyl Urea
CAS RN: 39236-46-9

E1171 200mg 1g



(4-Ethoxyphenyl)urea
CAS RN: 150-69-6

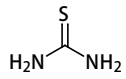
B4483 1g 5g



1,3-Bis(4-methoxyphenyl)-urea
CAS RN: 1227-44-7

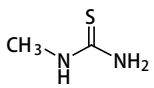
硫脲类
Thioureas

T2475 300g



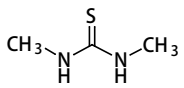
Thiourea
CAS RN: 62-56-6

M0619 25g 100g



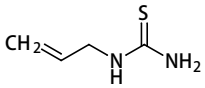
N-Methylthiourea
CAS RN: 598-52-7

D0804 25g 100g 500g



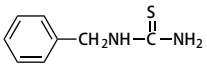
1,3-Dimethylthiourea
CAS RN: 534-13-4

A0220 25g 100g 500g



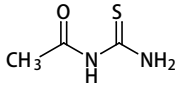
1-Allyl-2-thiourea
CAS RN: 109-57-9

B4612 1g 5g



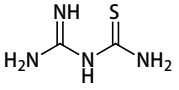
Benzylthiourea
CAS RN: 621-83-0

A0117 25g 500g



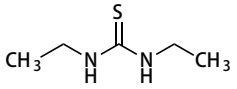
1-Acetyl-2-thiourea
CAS RN: 591-08-2

G0234 25g 100g 500g



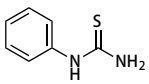
Guanylthiourea
CAS RN: 2114-02-5

D0530 25g 500g



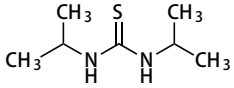
1,3-Diethyl-2-thiourea
CAS RN: 105-55-5

P0237 25g 500g



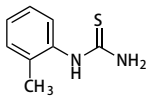
1-Phenyl-2-thiourea
CAS RN: 103-85-5

D0253 25g



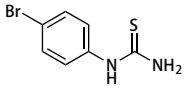
1,3-Diisopropylthiourea
CAS RN: 2986-17-6

T0657 25g



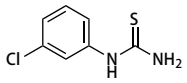
o-Tolylthiourea
CAS RN: 614-78-8

B4484 1g 5g



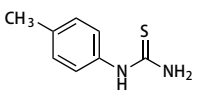
(4-Bromophenyl)thiourea
CAS RN: 2646-30-2

C3168 1g 5g



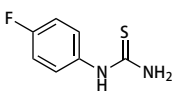
(3-Chlorophenyl)thiourea
CAS RN: 4947-89-1

T0656 5g



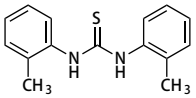
p-Tolylthiourea
CAS RN: 622-52-6

F0836 5g 25g



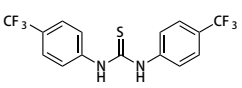
(4-Fluorophenyl)thiourea
CAS RN: 459-05-2

D0802 25g 500g



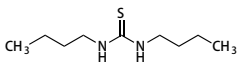
1,3-Di(*o*-tolyl)thiourea
CAS RN: 137-97-3

B4611 1g 5g



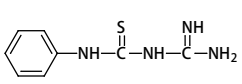
1,3-Bis[4-(trifluoromethyl)-phenyl]thiourea
CAS RN: 1744-07-6

D0301 25g 500g



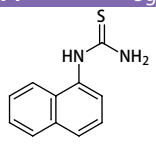
1,3-Dibutylthiourea
CAS RN: 109-46-6

P1167 5g



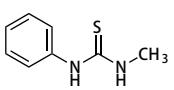
1-Phenyl-3-guanylthiourea
CAS RN: 15989-47-6

N0071 5g 25g



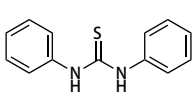
1-(1-Naphthyl)-2-thiourea
CAS RN: 86-88-4

M2786 1g 5g



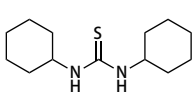
1-Methyl-3-phenylthiourea
CAS RN: 2724-69-8

T0197 25g 500g



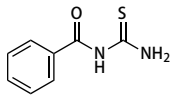
1,3-Diphenylthiourea
CAS RN: 102-08-9

D0440 5g 25g



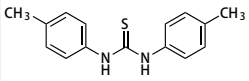
1,3-Dicyclohexylthiourea
CAS RN: 1212-29-9

B0802 25g



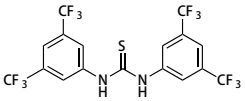
N-Benzoylthiourea
CAS RN: 614-23-3

D0803 5g 25g



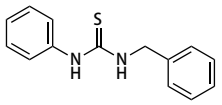
1,3-Di(*p*-tolyl)thiourea
CAS RN: 621-01-2

B3452 200mg 1g



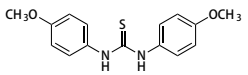
1,3-Bis[3,5-bis(trifluoromethyl)-phenyl]thiourea
CAS RN: 1060-92-0

B4997 1g 5g



1-Benzyl-3-phenylthiourea
CAS RN: 726-25-0

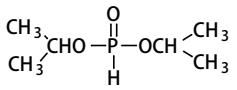
B4482 1g



1,3-Bis(4-methoxyphenyl)-thiourea
CAS RN: 1227-45-8

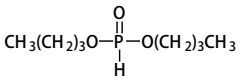
亚磷酸二烷基酯类
Dialkyl Phosphites

P0629 25g 500g



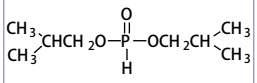
Diisopropyl Phosphite
CAS RN: 1809-20-7

D0300 25g



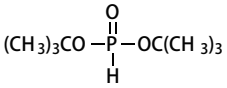
Dibutyl Phosphite
CAS RN: 1809-19-4

D3417 25g 100g 500g



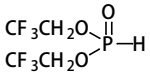
Diisobutyl Phosphite
CAS RN: 1189-24-8

D5814 1g 5g



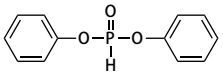
Di-*tert*-butyl Phosphonate
CAS RN: 13086-84-5

B2627 5g 25g



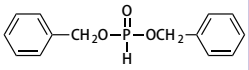
Bis(2,2,2-trifluoroethyl)-Phosphite
CAS RN: 92466-70-1

D0907 25g 100g 500g



Diphenyl Phosphite
CAS RN: 4712-55-4

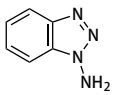
P1016 5g 25g 250g



Dibenzyl Phosphite
CAS RN: 17176-77-1

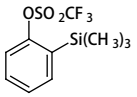
苯炔前体类
Benzyne Precursors

A1464 1g 5g



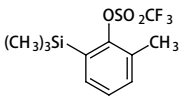
1-Aminobenzotriazole
CAS RN: 1614-12-6

T2089 1g 5g 25g



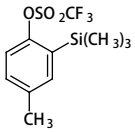
2-(Trimethylsilyl)phenyl Trifluoromethanesulfonate
CAS RN: 88284-48-4

M1883 1g 5g



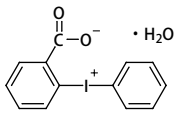
2-Methyl-6-(trimethylsilyl)phenyl Trifluoromethanesulfonate
CAS RN: 556812-44-3

M1882 1g 5g



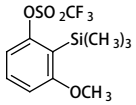
4-Methyl-2-(trimethylsilyl)phenyl Trifluoromethanesulfonate
CAS RN: 262373-15-9

D2503 5g 25g



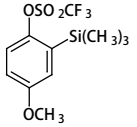
Diphenyliodonium-2-carboxylate Monohydrate
CAS RN: 96195-89-0

M1884 1g 5g



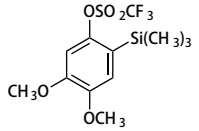
3-Methoxy-2-(trimethylsilyl)phenyl Trifluoromethanesulfonate
CAS RN: 217813-03-1

M1885 1g 5g



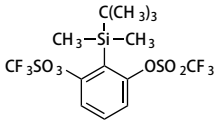
4-Methoxy-2-(trimethylsilyl)phenyl Trifluoromethanesulfonate
CAS RN: 556812-41-0

D3883 1g 5g



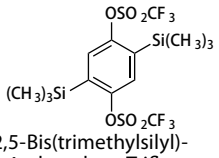
4,5-Dimethoxy-2-(trimethylsilyl)-phenyl Triflate
CAS RN: 866252-52-0

B5557 200mg 1g



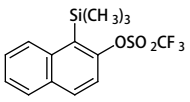
2-(*tert*-Butyldimethylsilyl)-1,3-phenylene Triflate
CAS RN: 1637638-66-4

B5559 1g



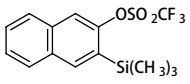
2,5-Bis(trimethylsilyl)-1,4-phenylene Triflate
CAS RN: 613676-07-6

T2465 1g 5g



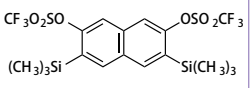
1-(Trimethylsilyl)-2-naphthyl Trifluoromethanesulfonate
CAS RN: 252054-88-9

T2466 1g 5g



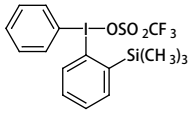
3-(Trimethylsilyl)-2-naphthyl Trifluoromethanesulfonate
CAS RN: 780820-43-1

B5080 1g



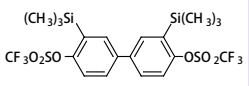
3,6-Bis(trimethylsilyl)-naphthalene-2,7-diyl Ditriflate
CAS RN: 947488-89-3

P1620 1g 5g



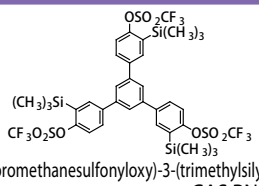
Phenyl[2-(trimethylsilyl)phenyl]-iodonium Trifluoromethanesulfonate
CAS RN: 164594-13-2

B3047 1g 5g



3,3'-Bis(trimethylsilyl)biphenyl-4,4'-diyl Bis(trifluoromethanesulfonate)
CAS RN: 828282-80-0

T2467 1g



1,3,5-Tris[4-(trifluoromethanesulfonyloxy)-3-(trimethylsilyl)phenyl]benzene
CAS RN: 847925-63-7

Lewis酸类
Lewis Acids

L0204 25g 300g

LiCl

Lithium Chloride Anhydrous
CAS RN: 7447-41-8

L0210 25g 100g 500g

LiBr

Lithium Bromide
CAS RN: 7550-35-8

N0850 25g 500g

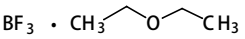
$NiCl_2$

Nickel(II) Chloride Anhydrous
CAS RN: 7718-54-9

Z0014 25g 300g

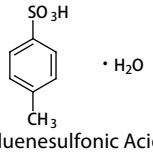
Zinc Chloride
CAS RN: 7646-85-7

B0527 25mL 100mL 500mL



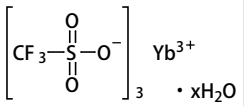
Boron Trifluoride - Ethyl Ether Complex
CAS RN: 109-63-7

T0267 25g 500g



p-Toluenesulfonic Acid Monohydrate
CAS RN: 6192-52-5

T1610 5g 25g

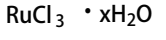


Ytterbium(III) Trifluoromethanesulfonate Hydrate
CAS RN: 54761-04-5

T2052 100mL 500mL

Titanium(IV) Chloride (14% in Dichloromethane, ca. 1.0mol/L)
CAS RN: 7550-45-0

R0074 1g 5g



Ruthenium(III) Chloride Hydrate
CAS RN: 14898-67-0

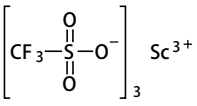
I0778 5g 25g

Indium(III) Chloride Anhydrous
CAS RN: 10025-82-8

B3546 25g 250g

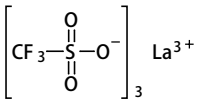
Bismuth(III) Chloride Anhydrous
CAS RN: 7787-60-2

T1663 1g 5g



Scandium(III) Trifluoromethanesulfonate
CAS RN: 144026-79-9

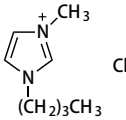
T1293 5g 25g



Lanthanum(III) Trifluoromethanesulfonate
CAS RN: 52093-26-2

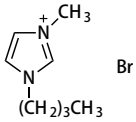
离子液体类
Ionic Liquids

B2194 5g 25g 100g



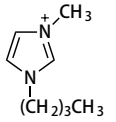
1-Butyl-3-methylimidazolium Chloride
CAS RN: 79917-90-1

B2193 5g



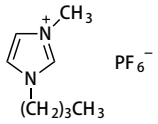
1-Butyl-3-methylimidazolium Bromide
CAS RN: 85100-77-2

B2195 5g 25g 100g



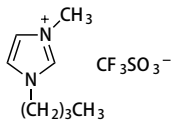
1-Butyl-3-methylimidazolium Tetrafluoroborate
CAS RN: 174501-65-6

B2320 5g 25g



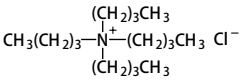
1-Butyl-3-methylimidazolium Hexafluorophosphate
CAS RN: 174501-64-5

B2337 5g 25g



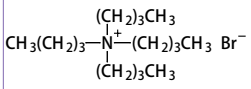
1-Butyl-3-methylimidazolium Trifluoromethanesulfonate
CAS RN: 174899-66-2

T0055 5g 25g 100g



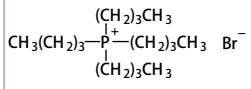
Tetrabutylammonium Chloride
CAS RN: 1112-67-0

T0054 25g 100g 500g



Tetrabutylammonium Bromide
CAS RN: 1643-19-2

T1124 25g 100g 500g



Tetrabutylphosphonium Bromide
CAS RN: 3115-68-2

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