

Isocyanates and Isothiocyanates



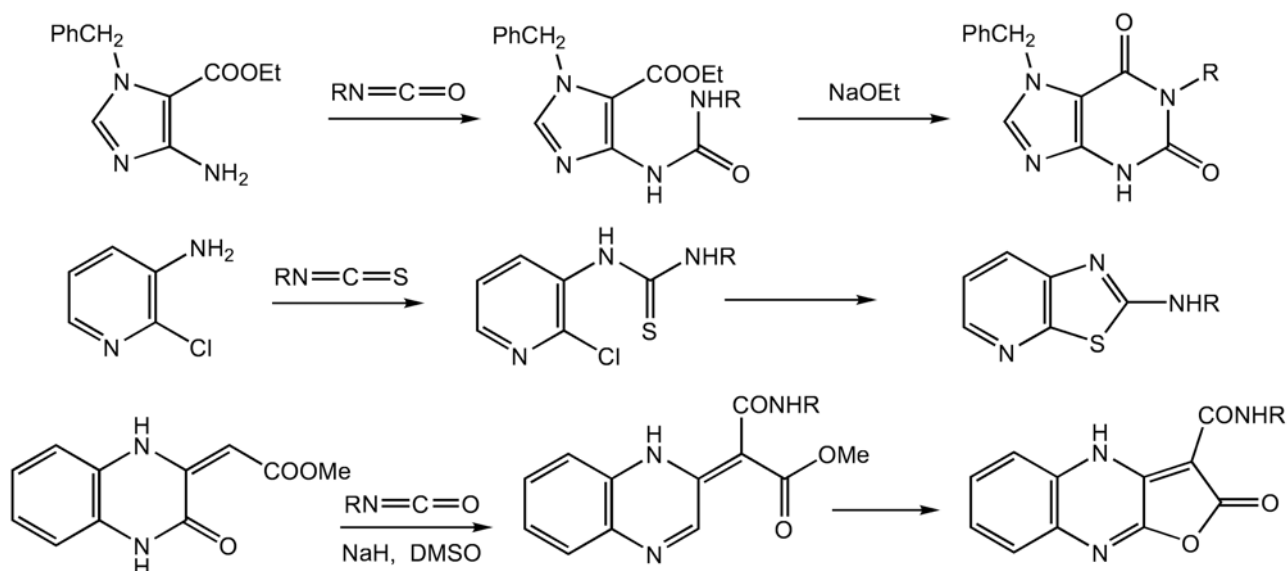
Isocyanates and isothiocyanates are important intermediates belonging to the family of compounds known as heterocumulenes. The chemistry of these molecules is dominated by two modes of reaction: nucleophilic addition and cycloaddition. Aspects of the chemistry of isocyanates and isothiocyanates are discussed in a number of books and review articles.¹⁻¹¹

Nucleophilic addition reactions

Alcohols and phenols readily attack isocyanates to give carbamates. Similarly, thiols give thiocarbamates, and amines ureas. In general, reactivity is in the order $\text{RSO}_2\text{NCO} > \text{RCONCO} > \text{Aryl-NCO} > \text{Alkyl-NCO}$, and for nucleophiles $\text{NH} > \text{OH} > \text{SH}$. The high yields and lack of byproducts with this type of reaction have led to their commercial exploitation in pharmaceuticals and agrochemicals, and particularly in the polymer field where the formation of polyurethanes from diisocyanates and diols accounts for the largest use of isocyanates. Reactions with carbon nucleophiles provide a useful synthetic access to substituted amides and other derivatives.

Isothiocyanates react with nucleophiles in a similar manner, although reaction rates are usually significantly lower. Isothiocyanates tend to be less sensitive to moisture and less unpleasant to handle, while still possessing a sufficient degree of reactivity for them to be very useful intermediates. A few illustrative examples of the reactions of isocyanates and isothiocyanates with nucleophiles are shown in Schemes 1-3.¹²⁻¹⁴

Schemes 1-3



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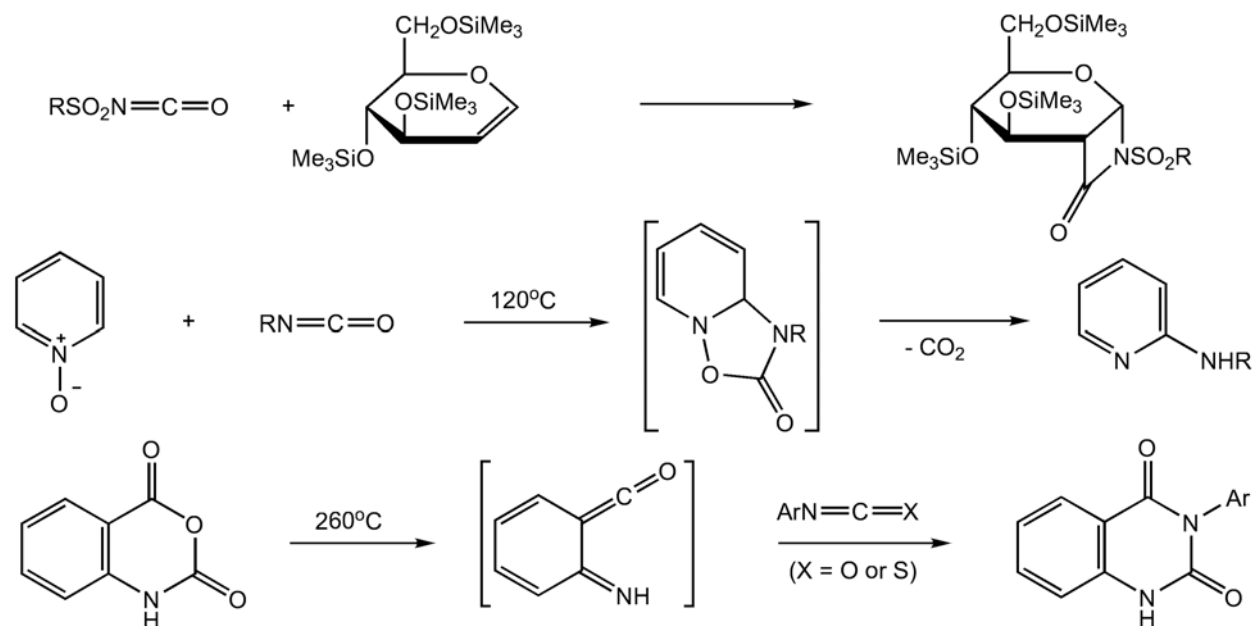
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Cycloaddition reactions

Isocyanates and isothiocyanates undergo cycloadditions, including [2+2], [3+2] dipolar and [4+2] reactions, with a variety of substrates. The products of these reactions (e.g. β -lactams) may be of interest in themselves, or they may undergo ring-opening to give other useful products. Some examples of various types of cycloaddition reactions involving isocyanates and isothiocyanates are shown in Schemes 4-6.¹⁵⁻¹⁷

Schemes 4-6



Product listings

Alkyl and aralkyl monoisocyanates

- | | |
|---|---|
| L18710 Allyl isocyanate | 41985 n-Butyl isocyanatoacetate |
| L02633 Benzyl isocyanate | A17289 2-Chloroethyl isocyanate |
| L20353 (1R,2R)-(-)-2-Benzyloxycyclohexyl isocyanate | L20226 (R)-(+)-(1-(4-Chlorophenyl)ethyl isocyanate |
| L20223 (1S,2S)-(+)-2-Benzyloxycyclohexyl isocyanate | L20227 (S)-(-)-1-(4-Chlorophenyl)ethyl isocyanate |
| L20224 (1R,2R)-(-)-Benzyloxycyclopentyl isocyanate | L15993 3-Chloropropyl isocyanate |
| L20225 (1S,2S)-(+)-2-Benzyloxycyclopentyl isocyanate | L20228 (R)-(-)-1-Cyclohexylethyl isocyanate |
| L20321 (R)-(+)-1-(4-Bromophenyl)ethyl isocyanate | L20229 (S)-(+)-1-Cyclohexylethyl isocyanate |
| L20322 (S)-(-)-1-(4-Bromophenyl)ethyl isocyanate | B23059 Cyclohexyl isocyanate |
| L11836 (+/-)-1-(4-Bromophenyl)ethyl isocyanate | L13380 1-Dodecyl isocyanate |
| L05664 1-Butyl isocyanate | B25180 Ethyl isocyanate |
| L13371 tert-Butyl isocyanate | L10609 Ethyl isocyanatoacetate |
| | L12751 Ethyl 6-isocyanatohexanoate |
| | L09988 Ethyl 2-isocyanato-3-methylbutyrate |
| | L13059 Ethyl 2-isocyanato-4-(methylthio)butyrate |

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Alkyl and aralkyl monoisocyanates con't

- L11613** Ethyl 2-isocyanato-4-methylvalerate
L10993 Ethyl 2-isocyanato-3-phenylpropionate
L09367 Ethyl 2-isocyanatopropionate
L09616 Ethyl 3-isocyanatopropionate
L20230 (R)-(+)-1-(4-Fluorophenyl)ethyl isocyanate
L20231 (S)-(-)-1-(4-Fluorophenyl)ethyl isocyanate
B21793 1-Heptyl isocyanate
L20232 (R)-(-)-2-Heptyl isocyanate
L20233 (S)-(+)-2-Heptyl isocyanate
L20234 (R)-(-)-2-Hexyl isocyanate
L20235 (S)-(+)-2-Hexyl isocyanate
L20237 (R)-(-)-1-Indanyl isocyanate
L20238 (S)-(+)-1-Indanyl isocyanate
A12890 (3-Isocyanatopropyl)triethoxysilane
L16105 Isopropyl isocyanate
L20330 (R)-(+)-1-(3-Methoxyphenyl)ethyl isocyanate
L20331 (S)-(-)-1-(3-Methoxyphenyl)ethyl isocyanate
L20239 (R)-(+)-1-(4-Methoxyphenyl)ethyl isocyanate
L20240 (S)-(-)-1-(4-Methoxyphenyl)ethyl isocyanate
L20241 (R)-(-)-3-Methyl-2-butyl isocyanate
L20354 (S)-(+)-3-Methyl-2-butyl isocyanate
L12286 (R)-(+)-1-(1-Naphthyl)ethyl isocyanate
L20242 (S)-(-)-1-(1-Naphthyl)ethyl isocyanate
L20236 (R)-(-)-2-Nonyl isocyanate
L20243 (S)-(+)-2-Nonyl isocyanate
L18745 1-Octadecyl isocyanate
L18746 1-Octyl isocyanate
L20244 (R)-(-)-2-Octyl isocyanate
L20245 (S)-(+)-2-Octyl isocyanate
L18706 tert-Octyl isocyanate
L13399 1-Pentyl isocyanate
L10305 (R)-(+)-1-Phenylethyl isocyanate
L11141 (S)-(-)-1-Phenylethyl isocyanate
L20355 (R)-(+)-1-Phenylpropyl isocyanate
L20246 (S)-(-)-1-Phenylpropyl isocyanate
L18707 1-Tetradecyl isocyanate
L10370 Trichloromethyl isocyanate

Alkyl diisocyanates

- 43803** 1,6-Diisocyanatohexane
L13759 Isophorone diisocyanate
43803 1,6-Diisocyanatohexane
L13759 Isophorone diisocyanate

Aryl monoisocyanates

- L12030** 3-Acetylphenyl isocyanate
L09665 4-Acetylphenyl isocyanate
L18714 3,5-Bis(methoxycarbonyl)phenyl isocyanate
L09582 3,5-Bis(trifluoromethyl)phenyl isocyanate
L11095 4-Bromo-2-methylphenyl isocyanate
L12521 2-Bromophenyl isocyanate
L12292 3-Bromophenyl isocyanate
L10834 4-Bromophenyl isocyanate
L09375 4-Bromo-2,6-dimethylphenyl isocyanate
L18716 2-(n-Butoxycarbonyl)phenyl isocyanate
L10606 4-(n-Butoxycarbonyl)phenyl isocyanate
L12877 4-n-Butoxyphenyl isocyanate
L12640 2-tert-Butyl-6-methylphenyl isocyanate
L09957 4-n-Butylphenyl isocyanate
L12955 5-Chloro-2,4-dimethoxyphenyl isocyanate
L10891 3-Chloro-4-fluorophenyl isocyanate
B22395 5-Chloro-2-methoxyphenyl isocyanate
L15995 2-(Chloromethyl)phenyl isocyanate
L11645 2-Chloro-6-methylphenyl isocyanate
L10802 3-Chloro-2-methylphenyl isocyanate
L12064 3-Chloro-4-methylphenyl isocyanate
L18711 4-(Chloromethyl)phenyl isocyanate
L10470 4-Chloro-2-methylphenyl isocyanate
L11567 5-Chloro-2-methylphenyl isocyanate
L12685 2-Chloro-4-nitrophenyl isocyanate
L15994 2-Chloro-5-nitrophenyl isocyanate
L11087 4-Chloro-3-nitrophenyl isocyanate
B21489 2-Chlorophenyl isocyanate
L11483 3-Chlorophenyl isocyanate
A14966 4-Chlorophenyl isocyanate
L09899 2-Chloro-5-(trifluoromethyl)phenyl isocyanate
L09850 4-Chloro-2-(trifluoromethyl)phenyl isocyanate
L12016 4-Chloro-3-(trifluoromethyl)phenyl isocyanate
L09432 3-Cyanophenyl isocyanate
L18744 2,6-Dibromo-4-fluorophenyl isocyanate
L18713 2,4-Dibromophenyl isocyanate
L14780 2,3-Dichlorophenyl isocyanate
L11089 2,4-Dichlorophenyl isocyanate
L09735 2,5-Dichlorophenyl isocyanate
L10421 2,6-Dichlorophenyl isocyanate

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Aryl monoisocyanates con't

A16298 3,4-Dichlorophenyl isocyanate
A19991 3,5-Dichlorophenyl isocyanate
L11339 2,6-Diethylphenyl isocyanate
A12415 2,4-Difluorophenyl isocyanate
L15996 2,5-Difluorophenyl isocyanate
L14779 2,6-Difluorophenyl isocyanate
L10613 2,6-Diisopropylphenyl isocyanate
L09762 2,4-Dimethoxyphenyl isocyanate
L11381 2,5-Dimethoxyphenyl isocyanate
L10443 4,5-Dimethyl-2-nitrophenyl isocyanate
L10225 2,3-Dimethylphenyl isocyanate
L11126 2,4-Dimethylphenyl isocyanate
L15999 2,5-Dimethylphenyl isocyanate
L12805 2,6-Dimethylphenyl isocyanate
L15998 3,4-Dimethylphenyl isocyanate
L11698 3,5-Dimethylphenyl isocyanate
L09560 2-(Ethoxycarbonyl)phenyl isocyanate
L09495 3-(Ethoxycarbonyl)phenyl isocyanate
L10681 4-(Ethoxycarbonyl)phenyl isocyanate
L11299 2-Ethoxyphenyl isocyanate
L11509 4-Ethoxyphenyl isocyanate
L15252 2-Ethylphenyl isocyanate
L12699 3-Ethylphenyl isocyanate
L12718 4-Ethylphenyl isocyanate
A17466 2-Fluorophenyl isocyanate
L01496 3-Fluorophenyl isocyanate
A12576 4-Fluorophenyl isocyanate
L16000 4-Iodophenyl isocyanate
L16002 3-Isocyanatobenzoyl chloride
L12703 2-Isopropyl-6-methylphenyl isocyanate
L10618 2-Isopropylphenyl isocyanate
L11217 4-Isopropylphenyl isocyanate
L12471 2-(Methoxycarbonyl)phenyl isocyanate

Aryl diisocyanates

L18712 4-Chloro-6-methyl-m-phenylene diisocyanate
L15740 4,4'-Methylenebis(phenyl isocyanate)

Acyl isocyanates

A11583 Benzoyl isocyanate
L00301 Chloroacetyl isocyanate

Sulfonyl isocyanates

L11182 Benzenesulfonyl isocyanate
L10019 4-Chlorobenzenesulfonyl isocyanate

L18709 3-(Methoxycarbonyl)phenyl isocyanate
L16001 2-Methoxy-5-methylphenyl isocyanate
L12086 4-Methoxy-2-methylphenyl isocyanate
A18075 2-Methoxyphenyl isocyanate
B24329 3-Methoxyphenyl isocyanate
A16805 4-Methoxyphenyl isocyanate
L19476 Methyl isocyanate, polymer-supported
L10636 2-Methyl-3-nitrophenyl isocyanate
L18715 2-Methyl-4-nitrophenyl isocyanate
L10850 2-Methyl-5-nitrophenyl isocyanate
L10757 4-Methyl-2-nitrophenyl isocyanate
L12669 4-Methyl-3-nitrophenyl isocyanate
L12008 3-(Methylthio)phenyl isocyanate
L12263 4-(Methylthio)phenyl isocyanate
A17200 1-Naphthyl isocyanate
A17210 2-Nitrophenyl isocyanate
A16920 3-Nitrophenyl isocyanate
A11194 4-Nitrophenyl isocyanate
L11686 4-Phenoxyphenyl isocyanate
A12808 Phenyl isocyanate
L12247 o-Tolyl isocyanate
L15255 m-Tolyl isocyanate
A13577 p-Tolyl isocyanate
L16003 2,4,6-Trichlorophenyl isocyanate
B20033 4-(Trifluoromethoxy)phenyl isocyanate
L11156 2-(Trifluoromethyl)phenyl isocyanate
L09448 3-(Trifluoromethyl)phenyl isocyanate
L12576 4-(Trifluoromethyl)phenyl isocyanate
L19206 4-(Trifluoromethylthio)phenyl isocyanate
L19349 2,4,6-Trifluorophenyl isocyanate
L09775 3,4,5-Trimethoxyphenyl isocyanate
L12611 2,4,6-Trimethylphenyl isocyanate

L04642 1,3-Phenylene diisocyanate
36733 Toluene-2,4-diisocyanate
L12745 Toluene-2,6-diisocyanate

L00226 Trichloroacetyl isocyanate

A17492 p-Toluenesulfonyl isocyanate

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Alkyl and arylalkyl monoisothiocyanates

- L02901** Allyl isothiocyanate
L19249 Benzhydryl isothiocyanate
A15008 Benzyl isothiocyanate
L20316 (1R,2R)-(-)-2-Benzyloxycyclohexylisothiocyanate
L20060 (1S,2S)-(+)-2-Benzyloxycyclohexylisothiocyanate
L20061 (1R,2R)-2-Benzyloxycyclopentyl isothiocyanate
L20062 (1S,2S)-2-Benzyloxycyclopentyl isothiocyanate
L19246 2-Bromoethyl isothiocyanate
L20319 (R)-(+)-1-(4-Bromophenyl)ethyl isothiocyanate
L20320 (S)-(-)-1-(4-Bromophenyl)ethyl isothiocyanate
A10935 1-Butyl isothiocyanate
L02668 tert-Butyl isothiocyanate
L10546 2-Chlorobenzyl isothiocyanate
L09579 4-Chlorobenzyl isothiocyanate
L11604 2-Chloroethyl isothiocyanate
L19974 (R)-(-)-1-(4-Chlorophenyl)ethyl isothiocyanate
L19975 (S)-(+)-1-(4-Chlorophenyl)ethyl isothiocyanate
L11307 2-(4-Chlorophenyl)ethyl isothiocyanate
L10120 Cyclododecyl isothiocyanate
L19976 (R)-(-)-1-Cyclohexylethyl isothiocyanate
L20063 (S)-(+)-1-Cyclohexylethyl isothiocyanate
A15585 Cyclohexyl isothiocyanate
L10129 Cyclohexylmethyl isothiocyanate
L13002 Cyclooctyl isothiocyanate
A11745 Cyclopentyl isothiocyanate
L11985 Cyclopropyl isothiocyanate
L12165 1-Decyl isothiocyanate
L11701 3,4-Dichlorobenzyl isothiocyanate
L10750 3-(Diethylamino)propyl isothiocyanate
L11817 2-(3,4-Dimethoxyphenyl)ethyl isothiocyanate
B21802 1-Dodecyl isothiocyanate
A19492 Ethyl isothiocyanate
L12504 Ethyl 3-isothiocyanatobutyrate
L12532 Ethyl 2-isothiocyanatopropionate
L10911 Ethyl 3-isothiocyanatopropionate
L12214 4-Fluorobenzyl isothiocyanate
L19977 (R)-(-)-1-(4-Fluorophenyl)ethyl isothiocyanate
L19978 (S)-(+)-1-(4-Fluorophenyl)ethyl isothiocyanate
L12123 (+/-)-1-(4-Fluorophenyl)ethyl isothiocyanate
A19410 Furfuryl isothiocyanate
L10866 1-Heptyl isothiocyanate
L20064 (R)-(-)-2-Heptyl isothiocyanate
L20065 (S)-(+)-2-Heptyl isothiocyanate
A12223 1-Hexyl isothiocyanate
L20066 (R)-(-)-2-Hexyl isothiocyanate
L20067 (S)-(+)-2-Hexyl isothiocyanate
L20068 (R)-(-)-1-Indanyl isothiocyanate
L19979 (S)-(+)-1-Indanyl isothiocyanate
A18932 Isobutyl isothiocyanate
A11641 Isopropyl isothiocyanate
L12342 4-Methoxybenzyl isothiocyanate
L10839 2-Methoxyethyl isothiocyanate
L20356 (R)-(-)-1-(3-Methoxyphenyl)ethyl isothiocyanate
L20069 (S)-(+)-1-(3-Methoxyphenyl)ethyl isothiocyanate
L20357 (R)-(-)-1-(4-Methoxyphenyl)ethyl isothiocyanate
L20070 (S)-(+)-1-(4-Methoxyphenyl)ethyl isothiocyanate
A15216 3-Methoxypropyl isothiocyanate
L11135 4-Methylbenzyl isothiocyanate
B20711 2-Methylbutyl isothiocyanate
L20071 (R)-(-)-3-Methyl-2-butyl isothiocyanate
L20317 (S)-(+)-3-Methyl-2-butyl isothiocyanate
L10501 3,4-(Methylenedioxy)benzyl isothiocyanate
A11757 Methyl isothiocyanate
L19464 Methyl isothiocyanate, polymer-supported
L11046 Methyl 2-isothiocyanatoacetate
L09996 Methyl 3-isothiocyanatopropionate
B22150 3-(Methylthio)propyl isothiocyanate
L12046 2-(4-Morpholino)ethyl isothiocyanate
L12819 3-(4-Morpholino)propyl isothiocyanate
L19980 (R)-(-)-1-(1-Naphthyl)ethyl isothiocyanate
L19981 (S)-1-(+)-(1-Naphthyl)ethyl isothiocyanate
L10066 1-Nonyl isothiocyanate
L19982 (R)-(-)-2-Nonyl isothiocyanate
L19983 (S)-(+)-2-Nonyl isothiocyanate
A14501 1-Octyl isothiocyanate
L19984 (R)-(-)-2-Octyl isothiocyanate
L19985 (S)-(+)-2-Octyl isothiocyanate
A14972 1-Pentyl isothiocyanate
L20315 (R)-(-)-1-Phenylethyl isothiocyanate
L19986 (S)-(+)-1-Phenylethyl isothiocyanate
B20011 (+/-)-1-Phenylethyl isothiocyanate
A15123 2-Phenylethyl isothiocyanate
L20318 (R)-(+)-1-Phenylpropyl isothiocyanate
L20072 (S)-(-)-1-Phenylpropyl isothiocyanate
L10931 3-Phenylpropyl isothiocyanate
L09463 2-(1-Piperidino)ethyl isothiocyanate
A14499 1-Propyl isothiocyanate
L10547 1-Tetradecyl isothiocyanate
L09878 Tetrahydrofurfuryl isothiocyanate
L08357 Triphenylmethyl isothiocyanate

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Alkyl diisothiocyanate

L09234 1,4-Butane diisothiocyanate

Aryl monoisothiocyanates

- L10134** 3-Acetylphenyl isothiocyanate
L11927 4-Acetylphenyl isothiocyanate
L19242 3-Benzyloxyphenyl isothiocyanate
L10038 4-Benzyloxyphenyl isothiocyanate
B20206 3,5-Bis(trifluoromethyl)phenyl isothiocyanate
L10218 4-Bromo-2-chlorophenyl isothiocyanate
L11469 4-Bromo-2,6-dimethylphenyl isothiocyanate
A19464 2-Bromo-4-fluorophenyl isothiocyanate
L09413 2-Bromo-4-methylphenyl isothiocyanate
B25296 4-Bromo-2-methylphenyl isothiocyanate
L09971 2-Bromophenyl isothiocyanate
L09871 3-Bromophenyl isothiocyanate
L11101 4-Bromophenyl isothiocyanate
L11051 4-Bromo-2-(trifluoromethyl)phenyl isothiocyanate
A18984 4-n-Butyl-2-methylphenyl isothiocyanate
A19578 4-n-Butylphenyl isothiocyanate
L11322 3-Carboxyphenyl isothiocyanate
B20516 3-Chloro-4-fluorophenyl isothiocyanate
L11769 5-Chloro-2-methoxyphenyl isothiocyanate
A19092 3-Chloro-4-methylphenyl isothiocyanate
L10778 4-Chloro-2-methylphenyl isothiocyanate
A19328 5-Chloro-2-methylphenyl isothiocyanate
L10898 2-Chloro-4-nitrophenyl isothiocyanate
L10506 4-Chloro-3-nitrophenyl isothiocyanate
A18238 2-Chlorophenyl isothiocyanate
A11999 3-Chlorophenyl isothiocyanate
A12693 4-Chlorophenyl isothiocyanate
L13016 2-Chloro-5-(trifluoromethyl)phenyl isothiocyanate
L10127 4-Chloro-3-(trifluoromethyl)phenyl isothiocyanate
L13045 3-Cyanophenyl isothiocyanate
L10173 4-Cyanophenyl isothiocyanate
B20930 2,3-Dichlorophenyl isothiocyanate
B20178 2,4-Dichlorophenyl isothiocyanate
L12672 2,6-Dichlorophenyl isothiocyanate
A19236 3,4-Dichlorophenyl isothiocyanate
B20687 3,5-Dichlorophenyl isothiocyanate
L12420 4-Diethylaminophenyl isothiocyanate
L10100 2,6-Diethylphenyl isothiocyanate
B20204 2,4-Difluorophenyl isothiocyanate
L12322 2,5-Difluorophenyl isothiocyanate
L11903 2,6-Difluorophenyl isothiocyanate
L10893 2,6-Diisopropylphenyl isothiocyanate
L12584 2,4-Dimethoxyphenyl isothiocyanate
A18630 2,5-Dimethoxyphenyl isothiocyanate
B21415 3,4-Dimethoxyphenyl isothiocyanate
A15728 3,5-Dimethoxyphenyl isothiocyanate
A12581 4-(N,N-Dimethylamino)azobenzene-4'-isothiocyanate
L09011 4-Dimethylaminophenyl isothiocyanate
L11665 2,4-Dimethylphenyl isothiocyanate
A19480 2,6-Dimethylphenyl isothiocyanate
A11302 3,5-Dimethylphenyl isothiocyanate
L12569 2-(Ethoxycarbonyl)phenyl isothiocyanate
L12522 4-(Ethoxycarbonyl)phenyl isothiocyanate
A18902 4-Ethoxyphenyl isothiocyanate
B20383 2-Ethyl-6-methylphenyl isothiocyanate
L09821 2-Ethylphenyl isothiocyanate
B24353 4-Ethylphenyl isothiocyanate
L09319 Fluorescein isothiocyanate, isomer 1
A18314 2-Fluorophenyl isothiocyanate
B25001 3-Fluorophenyl isothiocyanate
A15561 4-Fluorophenyl isothiocyanate
L11012 2-Iodophenyl isothiocyanate
L10235 3-Iodophenyl isothiocyanate
L12583 4-Iodophenyl isothiocyanate
A19448 2-Isopropylphenyl isothiocyanate
L12949 4-Isopropylphenyl isothiocyanate
L09674 2-Methoxybiphenyl 3-isothiocyanate
B20693 2-Methoxycarbonylphenyl isothiocyanate
L10476 3-Methoxycarbonylphenyl isothiocyanate
L10474 4-Methoxycarbonylphenyl isothiocyanate
L11085 2-Methoxy-5-methylphenyl isothiocyanate
L12150 2-Methoxy-4-nitrophenyl isothiocyanate
B22247 4-Methoxy-2-nitrophenyl isothiocyanate
L11799 2-Methoxyphenyl isothiocyanate
A15090 3-Methoxyphenyl isothiocyanate
A15331 4-Methoxyphenyl isothiocyanate
L10438 4-Methyl-2-nitrophenyl isothiocyanate
L11421 2-(Methylthio)phenyl isothiocyanate
L12999 3-(Methylthio)phenyl isothiocyanate
L09270 4-(Methylthio)phenyl isothiocyanate

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Isocyanates and isothiocyanates Con't



Aryl monoisothiocyanates con't

L12418 1-Naphthyl isothiocyanate
L09669 2-Nitrophenyl isothiocyanate
L11335 3-Nitrophenyl isothiocyanate
L11042 4-Nitrophenyl isothiocyanate
L11874 Pentafluorophenyl isothiocyanate
L11181 4-Phenylazophenyl isothiocyanate
A11596 Phenyl isothiocyanate
L12375 2,3,4,5-Tetrachlorophenyl isothiocyanate
L12737 2,3,5,6-Tetrafluorophenyl isothiocyanate
B22845 o-Tolyl isothiocyanate

A17345 m-Tolyl isothiocyanate
A11499 p-Tolyl isothiocyanate
L12119 2,3,4-Trichlorophenyl isothiocyanate
L11551 2,4,5-Trichlorophenyl isothiocyanate
L12118 2,4,6-Trichlorophenyl isothiocyanate
L10586 2-(Trifluoromethyl)phenyl isothiocyanate
L11646 3-(Trifluoromethyl)phenyl isothiocyanate
L11890 4-(Trifluoromethyl)phenyl isothiocyanate
L09478 2,4,6-Trifluorophenyl isothiocyanate
L10709 3,4,5-Trimethoxyphenyl isothiocyanate

Aryl diisothiocyanate

L09756 1,4-Phenylene diisothiocyanate

Acyl isothiocyanates

L06964 Benzoyl isothiocyanate

L00911 Ethoxycarbonyl isothiocyanate

Other isocyanates and isothiocyanates

22527 Butoxysilanetriisocyanate

A12633 Trimethylsilyl isocyanate

L03277 Trimethylsilyl isothiocyanate

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