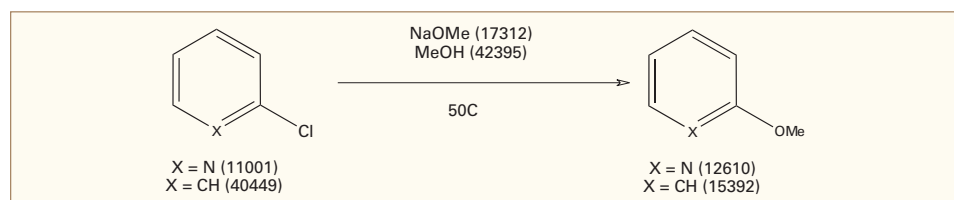


Active Chloro-Heterocycles

Active chloro-heterocycles (heteroaromatic compounds in which a chlorine substituent is *ortho* or *para* to the nitrogen of an electron-deficient aromatic ring, or is activated by the presence of an additional electron-withdrawing substituent) are an extremely versatile class of building blocks in organic synthesis because of their propensity to undergo aromatic substitution when treated with classical nucleophiles.

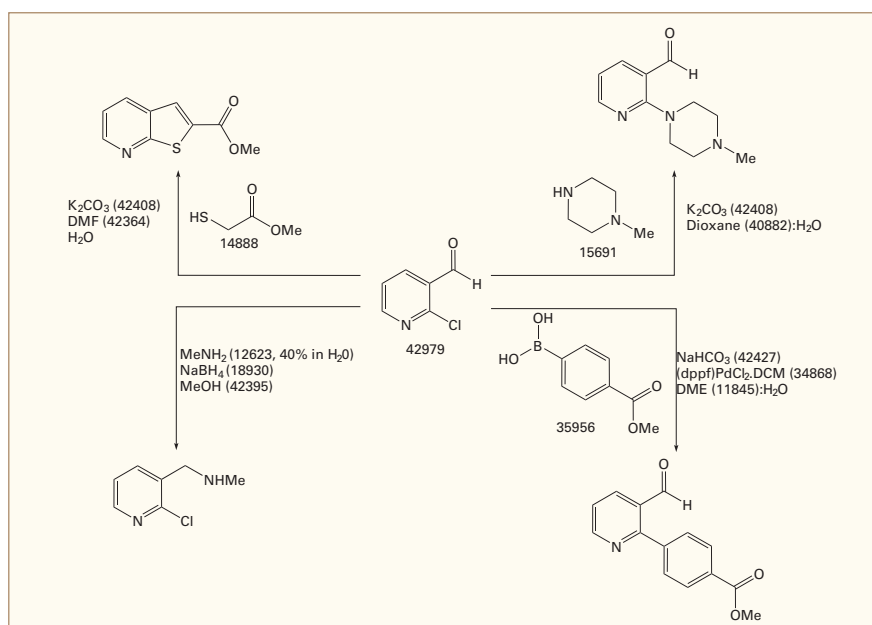
For example, 2-chloropyridine (1, X = N) is reportedly 230,000,000 times more reactive than chlorobenzene (1, X = CH) for the displacement of the chlorine by methoxide:



This activation occurs because ring nitrogens stabilize the dearomatized anionic intermediates (Meisenheimer complexes such as **2**) which arise during the typical two-stage addition/elimination mechanism for such $\text{S}_{\text{N}}\text{Ar}$ reactions.

Oxidative insertion of transition metals (e.g. Pd) into the activated carbon-chlorine bond also occurs readily for such substrates, allowing coupling with an even broader range of non-classical nucleophilic partners. In many cases, nucleophilic substitution can be carried out in the presence of other functional groups, allowing further downstream chemistry to be performed. By careful choice of reaction conditions, the "active" chlorine can also be retained in early chemistry and the $\text{S}_{\text{N}}\text{Ar}$ reaction carried out as a later step. Such chemoselectivity gives the opportunity for building complex product libraries, with little practical difficulty, from suitable active chloro-heterocyclic templates such as **42979**:

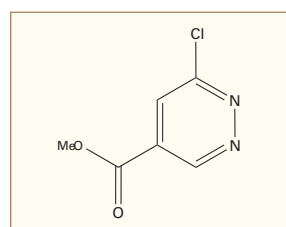
The use of active chloro-heterocycles offers greater atom efficiency, and potentially higher throughput at the plant scale, than the corresponding bromide or iodide. Such factors are important in meeting the demands for "greener" chemistry within the industry.



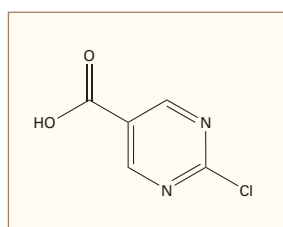
MORE THAN 300 ACTIVE CHLORO-HETEROCYCLES

Acros Organics offer more than 300 structurally diverse active chloro-heterocycles, with >40 brand-new introductions.

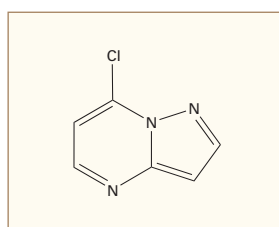
Examples of recent Acros Organics new products:



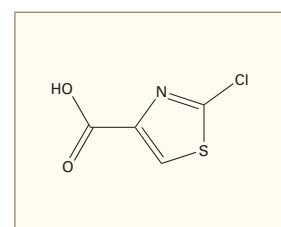
[43298]



[42947]



[43849]



[42955]

A SELECTION OF CHLORO-HETEROCYCLES FROM THE ACROS ORGANICS RANGE

Product Name	Product Code	CASNo	Purity
2-Chloroquinoxaline	136190010, 1GR; 136190050, 5GR	1448-87-9	97%
3-Chloro-6-methoxypyridazine	148740050, 5GR; 148740250, 25GR	1722-10-7	97%
1,4-Dichlorophthalazine	155090010, 1GR; 155090050, 5GR	4752-10-7	98%
6-Chloro-2-pyridinol	159660250, 25GR; 159661000, 100GR	16879-02-0	98%
2-Chloro-3-(trifluoromethyl)pyridine	241790050, 5GR; 241790250, 25GR	65753-47-1	97%
6-Chloro-3-(hydroxymethyl)pyridine	358090010, 1GR; 358090050, 5GR; 358090250, 25GR	21543-49-7	98%
3-Bromo-2-chloropyridine	360650010, 1GR; 360650050, 5GR; 360650250, 25GR	52200-48-3	98%
4-Amino-5-bromo-2-chloropyrimidine	429380010, 1GR; 429380050, 5GR	205672-25-9	97%
2-Chloropyrimidine-5-carboxylic acid	429470010, 1GR; 429470050, 5GR	374068-01-6	97%
2-Amino-6-chloropyridine	429500010, 1GR; 429500050, 5GR	45644-21-1	97%
6-Chloropyridazine-3-carboxylic acid	429530010, 1GR; 429530050, 5GR	5096-73-1	97%
2-Chlorothiazole-4-carboxylic acid	429550010, 1GR; 429550050, 5GR	5198-87-8	97%
2-Chloropyrimidine-5-sulfonyl chloride	429630010, 1GR; 429630050, 5GR	98026-88-1	97%
2-Chloro-4,6-dimethylpyridine-3-carbonitrile	429780050, 5GR; 429780250, 25GR	14237-71-9	97%
2-Chloro-3-pyridinecarboxaldehyde	429790010, 1GR; 429790050, 5GR	36404-88-3	98%
2-Chloro-5-fluoropyrimidine	429810010, 1GR; 429812500, 250MG	62802-42-0	98%
2-Chloropyridine-3-boronic acid	430640010, 1GR; 430640050, 5GR	381248-04-0	97%
2-Chloropyridine-3-boronic acid pinacol ester	430660010, 1GR; 430660050, 5GR	452972-11-1	97%
Ethyl 6-chloropyridazine-3-carboxylate	431110010, 1GR; 431110050, 5GR	75680-92-1	
Methyl 6-chloropyridazine-4-carboxylate	432980010, 1GR; 432980050, 5GR	1093860-48-0	97%
4-Bromomethyl-2,6-dichloropyridine	433440010, 1GR; 433440050, 5GR	175204-45-2	97%
4,6-Dichloro-2-methylpyrimidine	434260050, 5GR; 434260250, 25GR	1780-26-3	97%
2-Chloro-6-methylpyrimidine-4-carboxylic acid	434300010, 1GR; 434300050, 5GR	89581-58-8	95%
2-Chloropyridine-3-sulfonyl chloride	434310010, 1GR; 434310050, 5GR	6684-06-6	97%
5-Amino-2-chloropyrimidine	434320010, 1GR; 434320050, 5GR	56621-90-0	95%
4-Bromo-2-chloropyridine	434800050, 5GR; 434800250, 25GR	73583-37-6	97%
2-Chloro-4-methoxypyridine	434930010, 1GR	17228-69-2	97%
2,4-Dichloro-5-nitropyrimidine	435290010, 1GR; 435290050, 5GR; 435290250, 25GR	49845-33-2	97%
3,6-Dichloropyridazine-4-carboxylic acid	436310050, 5GR	51149-08-7	97%
6-Chloropyridine-2-carboxylic acid	436660010, 1GR; 436660050, 5GR	4684-94-0	97%
6-Chloro-7-deazapurine	437440010, 1GR; 437440050, 5GR	3680-69-1	97%
N3-Benzyl-2-chloronicotinamide	438300050, 5GR	65423-28-1	95%
2-Chloropyrimidine-5-carboxaldehyde	438450010, 1GR; 438450050, 5GR	933702-55-7	97%
7-Chloropyrazolo[1,5-a]pyrimidine	438490010, 1GR; 438490050, 5GR	58347-49-2	95%
4-Aminomethyl-2-chloropyridine	438890010, 1GR; 438890050, 5GR	144900-57-2	95%
2-Chloro-1,3-dimethylimidazolidinium tetrafluoroborate	439460010, 1GR; 439460050, 5GR	153433-26-2	96%
2-Chloro-1,3-dimethylimidazolium chloride	439520050, 5GR; 439520250, 25GR; 439521000, 100GR	37091-73-9	90%
5,7-Dichloro-1,6-naphthyridine	440670010, 1GR; 440670050, 5GR	337958-60-8	97%
2-Chloro-5-pyrimidinecarbonyl chloride	441310010, 1GR; 441310050, 5GR	110099-99-5	95%
2-Chloro-5-ethylpyrimidine	441730010, 1GR; 441730050, 5GR	111196-81-7	97%
6-Chloronicotinoyl chloride	442250250, 25GR	58757-38-3	97%
5-Amino-4,6-dichloro-2-methylpyrimidine	442520010, 1GR; 442520100, 10GR	39906-04-2	97%
2,5-Dichloroisonicotinic acid	442830010, 1GR	88912-26-9	97%
2-Chloro-5-fluoropyridine	442860010, 1GR; 442860050, 5GR	31301-51-6	95%
2-Chloro-5-(trifluoromethyl)pyridine-3-carboxylic acid	MAY00257DA, 1GR	505084-59-3	97%



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