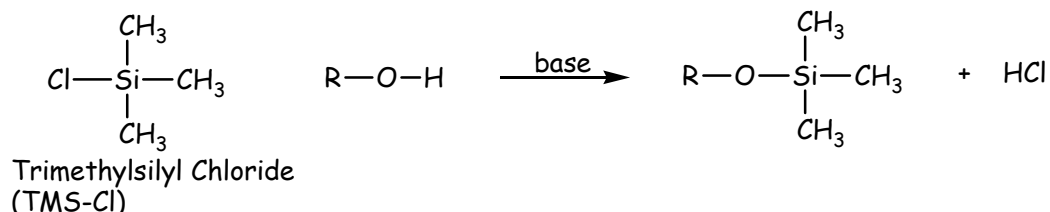


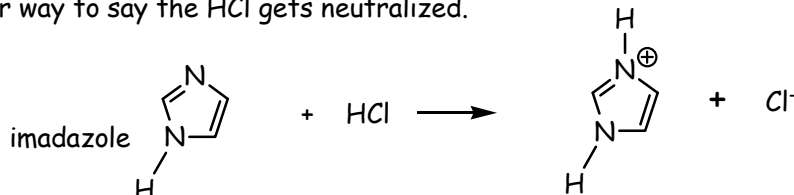
Silyl Ethers- Good protecting groups for alcohols

Alcohols have an acidic hydrogen and cannot be present when strong bases (strong nucleophiles) are used. The alcohol must be protected to prevent the acid/base reaction of the alcohol and nucleophile. Common protecting groups include silyl ethers.

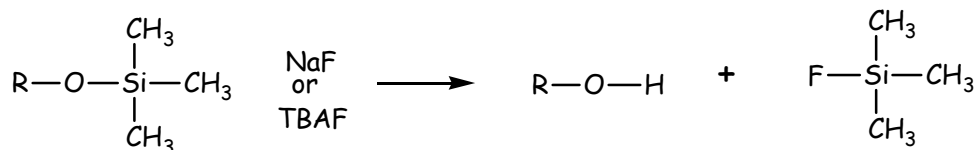
Silyl ethers are prepared by adding a trialkyl silyl chloride to the alcohol. The silyl group replaces the proton of the alcohol group. The by-product is HCl which is why a base is usually employed to neutralize the HCl as it forms.



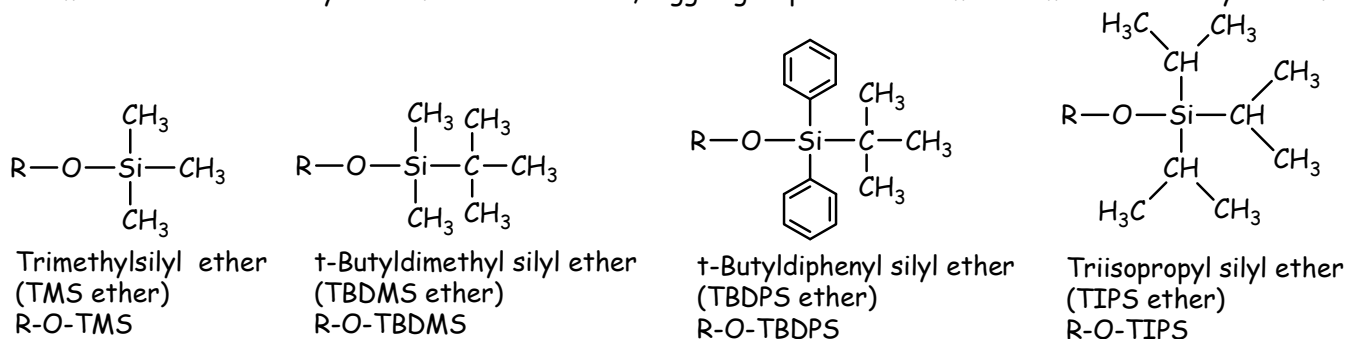
Imidazole is one of the most common bases used for this reaction. Imidazole acts as a "proton sponge" which is another way to say the HCl gets neutralized.



Silyl groups are removed using fluoride ion. Sodium fluoride sometimes works but for an organic-soluble source of fluoride, tetrabutyl ammonium fluoride (TBAF) is most commonly used.



These are the common silyl groups used as protecting groups. Generally, the bigger the groups on silicon, the more robust is the silyl ether. In other words, bigger groups on silicon make a more stable silyl ether.



Silyl ethers are easy to prepare due to the strength of the oxygen-silicon bond that is formed. Silyl groups are easily removed with fluoride since the silicon-fluorine bond is one of the strongest covalent bonds.

Making silyl ether is called the protection step; removing the silyl group is called the deprotection step. Both steps must be quantitative in order to be synthetically useful.