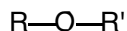


Ethers

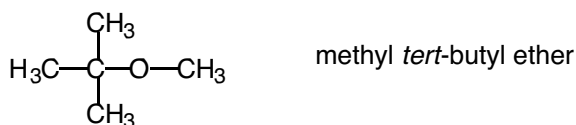
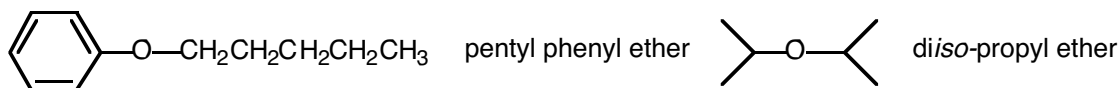
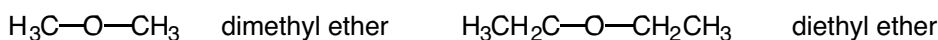
Like alcohols ethers are oxygen containing organic compounds. They differ from alcohols in that there are two alkyl chains bound to the oxygen and not just one as in alcohols. Ethers have the general formula:



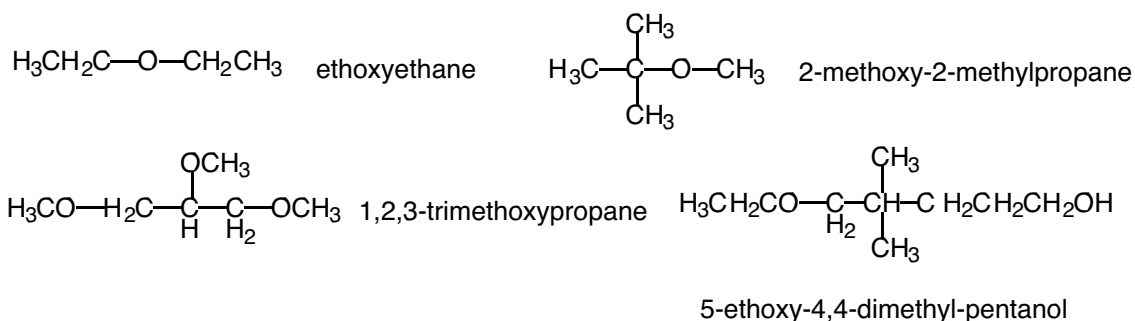
With the oxygen present, ethers are able to participate in hydrogen bonds. But, since there is not a hydrogen atom bonded with that oxygen, a hydrogen bond cannot be initiated. Thus an ether could potentially hydrogen bond with water or an alcohol, but it could not hydrogen bond with another ether.

Ethers are polar compounds, as one might expect from the presence of the oxygen. Polar interactions can be found between different molecules of ether. Comparing the boiling points of ethers to alkanes of similar molecular weight one will find that the boiling points of the ethers are higher. As discussed with hydrogen bonding in alcohols, additional energy is needed to overcome the stabilizing effect of the interaction. A polar interaction is not as stable as a hydrogen bond and not as much energy is needed to overwhelm it. Thus ethers tend to have a lower boiling point than alcohols.

Many ethers are named by their common names. This is simply the names of the two hydrocarbon chains (in substituent form, “-yl”) followed by “ether”. If the two hydrocarbon chains are the same, the prefix “di” is used. Here are some examples.

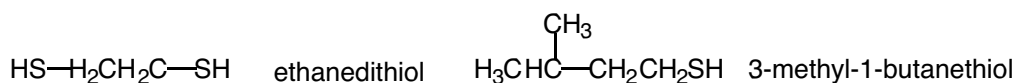
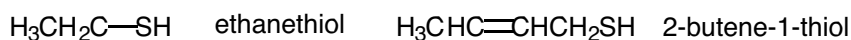


The common names given above are not IUPAC names. Under the IUPAC system ether groups do not have any priority, so it is not given a suffix to be placed after the parent chain name. Ethers are always treated as substituents and are assigned the prefix “oxy”. All of the nomenclature rules that have been discussed apply. Below are some examples. Notice with last example with the alcohol.

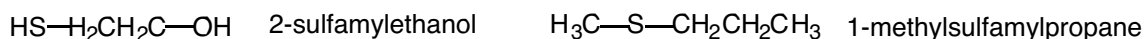


Thiols, Thio-ethers, and Disulfides: Though oxygen-carbon bonding is much more common, sulfur-carbon bonding is also very important. One could consider thiols and thio-ethers to be the sulfur analogs of alcohols and ethers.

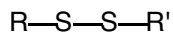
The naming of these compounds are is similar to their oxygen counterparts, but instead of alcohols, these compounds are called thiols. Following the name, thiols are simply given the suffix “thiol”. They are named in a manner similar to alcohols as seen in the following examples.



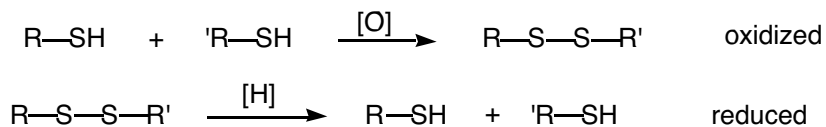
Thiols are one step below alcohols in naming priority. There for if there is a compound that contains both an alcohol and a thiol the alcohol will be names as the suffix (placed on the longest carbon chain). The ranking of functional groups is necessary as most organic compound have more than one functional group on them. The sulfur containing function group is named as a substituent when it is on a compound with a functional group of higher priority or it is a thio-ether. As a substituent the sulfur group is given the prefix “sulfanyl”. Thio-ethers are given the prefix “sulfamyl”. Here are two examples.



An important reaction that thiols participate in is the formation of a disulfide bond.



Here two thiols are oxidized (hydrogen removed) and link together in a covalent bond. This can occur easily just in the presence of oxygen or other oxidizing agents (depicted by “[O]”). This is astrong, covalent bonds, but it can be broken by reduction or by exchange with another thiol containing compounds.



This type of bond is very important in the structure of proteins. The amino acid cystine contains a thiol group. This thiol group will hang off of the backbone of the protein. When a disulfide forms between two cystines a bridge (disulfide bridge) is effectively

formed between two parts of the protein chain (can form between chains as well). One common use of this bond is in a styling “perm”. In this procedure a chemical is applied to the hair to reduced disulfide bonds that are contained in the hair protein. The hair is then shaped and the disulfides are allowed to re-oxidize, leaving the formed shape.

