



www.sciencemadness.org

Improvised Reflux Condenser, by CHROMIUM

Sometimes one needs to boil small quantities of liquid for a long time. This is not as easy as it may seem because of liquid losses by evaporation. Loss of liquid is not always a problem – for example one may compensate evaporation of water by adding some more – but this is not of any help if the substances that become lost are your desired reaction products.

These problems can be solved by using reflux condensers. Dedicated reflux condensers can be bought from glassware sellers but you can make your own, especially if you prefer to experiment with small quantities.

Probably the simplest reflux condenser would be if we place a cold object over boiling liquid. Vapour condenses on cold surfaces and flows back into the liquid. This would be a rather good way if only our cold object would remain cold as long as we want.

This can be accomplished by placing a stoppered test tube over boiling liquid and driving cold water through it. If vapour can not escape without contact with cold surfaces then we have a quite useable reflux condenser.

Another way is to take glass tube approximately 25 cm long and to bend it from the center part to get an incredibly narrow U tube. I used glass tubing with 6mm outer diameter. The central bend was rather hard to make. I had to try it 4 times (and spent 4 tubes) before I got a "U" that was thin enough to fit into a test tube with 15mm inner diameter. Two or three additional bends will make it coil-like for increased efficiency. Cheap resin tubing can be used to supply such a condenser with cold tapwater. Such condenser can be placed in the neck of a suitable test tube. Small quantities of liquid can be boiled then for many hours without noticeable loss. Of course you have to use boiling stones and a water (or oil) bath is good to ensure quiet boiling.

If the condenser is intended to use solely with organic solvents then it can be made from metal tubing. More complex coil shapes can probably even be placed in neck of common boiling flasks.

Condensers of this kind are good for many organic experiments. Synthesizing of esters is a good example.

Figure 1: improvised condenser designs

