High and dry

There are times in the laboratory where it is desirable to ensure that a chemical is either dried completely or remains dehydrated once it has been dried out. Both these functions can be carried out by a desiccator.

The most common type of desiccator found in schools consist of a dome-shaped container made of thick glass. It has a main body and a heavy lid. The lid has a ground-glass edge which is coated with a thin layer of a suitable lubricant to ensure an airtight seal.

The interior of the desiccator is usually separated in two by a mesh platform. The desiccating agent is placed in the bottom and the material to be dried is placed on the mesh platform. The lid is then replaced and the drying agent left to do its work.

A common variant of this design is the Vacuum desiccator- as shown in Figure 1: this is very similar to the basic design but, they also have a valve on the top of the lid that allows the connection of a vacuum pump. This design allows for faster drying – and also stronger drying.

If you need a vacuum desiccator then there is no real alternative but to buy one. However, then non-vacuum type can be easily replaced by a DIY version.

Figure 2 - A DIY desiccator.

You can easily make your own simple desiccator from an air-tight plastic container, like an ice-cream container (Figure 2). You place the drying agent in an open container like an evaporating basin, and the material to be dried can be placed near it, in a separate open container, like a watch glass or another evaporating basin.

You can also make a version from resealable bag. In exactly the same way as above – though you will need to make sure there are no holes in the bag. In fact, it is probably preferable to place one bag inside another.

Placing a smaller desiccator in a bigger one may not always be required, though it will improve performance.

Table 1 below shows the results a quick test: two samples of potassium hydroxide (KOH) pearls were put on watch glasses and weighed. One was put in a DIY desiccator with some silica gel in as shown and the other left on the bench. 90 minutes later they were both weighed again.

The sample in the desiccator clearly absorbed less water and as time goes on this difference will increase as there is initially a certain amount of water vapour in the air inside the desiccator that can be absorbed but, once that is gone, the seal prevents any significant ingress of any more.

Figure 1 - A vacuum desiccator. Image by Cjp24 on Wikimedia Commons under a Creative Commons License.

Whatever their design, whenever the desiccator is opened, the contents are exposed to moisture in the air. They also take quite some time to achieve a sufficiently low level of humidity so they are not for fast drying. They are, however, quite effective at either a final drying or for keeping already dry materials dehydrated.

It is important to note that desiccators don't work well for materials that are very highly hygroscopic.

Desiccating agents

There are many different chemicals that can be used in desiccators. A few commonly used ones are:

- Various anhydrous salts such as anhydrous calcium chloride, anhydrous calcium sulphate (drierite), anhydrous magnesium sulphate.
- Silica gel (this usually has a small amount of cobalt indicator added which turns from blue to pink on absorption of moisture. This lets you know when to regenerate the desiccant.
- Potassium or sodium hydroxide.
- Concentrated sulphuric acid. <<

	In desiccator	On bench
Mass of KOH (g)	1.725	1.775
Total mass – start (g) (T=0)	12.702	10.341
Total mass - finish (g) (T-90)	12.734	10.435
Difference	-0.032	-0.094
% change	**1.86%**	**5.30%**

Table 1 - Effectiveness of a DIY desiccator.