Handling air-sensitive compounds

Many materials of interest to inorganic chemists are sensitive to oxygen and/or moisture. Thermodynamically, the oxidation of nearly all metal complexes is "downhill", but metals can be stabilized kinetically against decomposition by the presence of ligands. However, if you're doing a reaction, you generally WANT one or more ligands to be displaced, and so the presence of water or oxygen at this crucial time can lead to decomposition. To prevent this occurring, inorganic chemists use a variety of special apparatus to manipulate materials under an inert atmosphere.

A **Schlenk line** consists of a double manifold: one is connected to a **vacuum pump**, and the other to a supply of pure nitrogen (or argon) gas. Flexible hoses connect the line to special reaction vessels called **Schlenk flasks**, which allow connection to the line through a tube with a tap on it. The dried flask can be evacuated by opening the taps to the **vacuum line**, thus removing the air inside. Refilling the flask through the nitrogen line produces a flask filled only with inert gas. Solvents and reactants can be added to the flask via ground-glass joints, which are opened against a counterflow of nitrogen to prevent air or moisture entering. Stoppering the flask results in the nitrogen exiting the line through an oil-filled **bubbler**, confirming the system is under positive pressure. Solvent can be removed by application of vacuum – the pump is protected from contamination by a **cold trap** at -196°C (a liquid nitrogen dewar). A skilled operator can perform practically any reaction or workup procedure on a Schlenk line, including flitration, distillation, recrystallization, etc.

All the inorganic research groups at UVic – the Berg, Hicks, McIndoe and Rosenberg groups – use Schlenk techniques to handle organometallic complexes, radicals, catalysts, pyrophoric reagents and the like under inert conditions. We also use **gloveboxes**: a nitrogen-filled chamber that can be accessed through long gloves mounted in a transparent front panel. Chemicals and apparatus are transferred in and out via an airlock (a full size and a mini-antechamber are present on the right of the glovebox in the picture).

The atmosphere inside the box is continuously purified by passing it through columns containing molecular sieves (removing water) and heated copper metal (removing oxygen).

See http://web.uvic.ca/~mcindoe/ for more details. *- Dr Scott McIndoe*