2.2: Gas Chromatography

Gas chromatography is probably the most common technique for introducing samples into a mass spectrometer. Complex mixtures are routinely separated by gas chromatography and mass spectrometry is used to identify and quantitate the individual components. Several different interface designs are used to connect these two instruments. The most significant characteristics of the inlets are the amount of GC carrier gas that enters the mass spectrometer and the amount of analyte that enters the mass spectrometer. If a large flow of GC carrier gas enters the mass spectrometer it will increase the pressure in the source region.

Probably the most common GC/MS interface uses a capillary GC column. Since the carrier gas flow rate is very small for these columns, the end of the capillary is inserted directly into the source region of the mass spectrometer. The entire flow from the GC enters the mass spectrometer. Since capillary columns are now very common, this inlet is widely used. However this design is not well suited for experiments with wide bore capillaries and packed GC columns which have higher flow rates. The increase in the flow rate significantly increases the pressure in the mass spectrometer and maintaining the required source pressure will require larger and more expensive vacuum pumps. Several inlet designs are available to reduce the gas flow into the source. The simplest design splits the GC effluent so that only a small portion of the total flow enters the mass spectrometer. Although this inlet reduces the gas load on the vacuum system, it also reduces the amount of analyte and thus the sensitivity. Effusive separators and membrane inlets are more selective and transport a higher fraction of the analyte into the source region. Each of these methods has efficiency and resolution drawbacks but they are necessary for some experiments.