Chemical Ionization Mass Spectrometer (CIMS)

Shanhu Lee, Kent State University (http://www.personal.kent.edu/~slee19/)

Chemical ionization is the use of ion molecules to selectively ionize a compound of interest. For example, SF$_6^-$ ion reagent is used to detect H$_2$SO$_4$:

\[
SF_6^- + H_2SO_4 \rightarrow H_2SO_4F^- + SF_5
\]

Because H$_2$SO$_4$F$^-$ is a unique ion reaction product that is only representative of H$_2$SO$_4$, selective detection of H$_2$SO$_4$ is possible. This is typical negative ion chemistry.

For positive ion chemistry, positive water ions (H$_3$O$^+$) can be used as a reagent. Because H$_3$O$^+$ transfers protons to a wide variety of organic compounds, this is a powerful method to detect organic compounds. This is also referred as to proton transfer chemical ionization mass spectrometry (PTR-CIMS).

A typical CIMS instrument can be constructed from an ion source, an ion molecular reactor, and a quadrupole mass spectrometer. Shown below is schematic diagram of a CIMS that detects H$_2$SO$_4$.

![Schematic diagram of a CIMS](image)

References:

