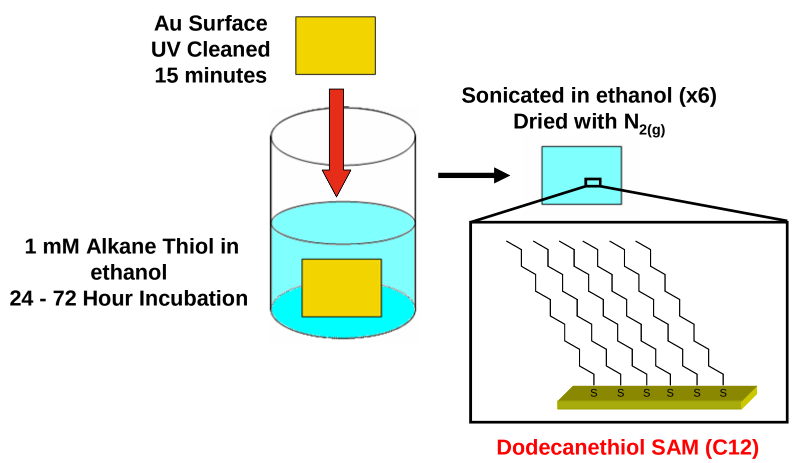
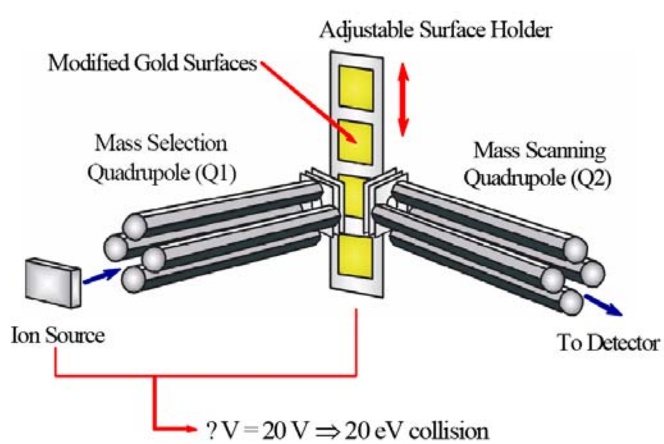
Self-Assembled Monolayers (SAMs) as Collision Surfaces for Ion Activation

Our group uses self-assembled monolayers (SAMs) as well-characterized surfaces to activate ions through ion-surface collisions. These thin films are advantageous as they function as an electron transfer barrier which in turn gives higher ion throughput and less neutralization when compared to bare metal surfaces. The terminal functional chemistry is easily manipulated by beginning with chemically modified thiols. Typically employed SAMs in our lab are $CH_3(CH_2)_nSH$, n=12 **(C12)**, 16 **(C16)**, 18 **(C18)** for hydrocarbon based surfaces and $CF_3(CF_2)_9(CH_2)_2SH$ **(C12F10)** for fluorinated surfaces. Generic formation of the SAMs is described below.

Self-Assembled Monolayer (SAM) Preparation



Once the SAMs are formed, they are introduced into the vacuum system of a variety of mass spectrometer instrument configurations. Below is a schematic of an Extrel dual quadrupole mass spectrometer. The surface holder for this particular instrument allows four separate surfaces to be introduced into the instrument simultaneously and it is oriented at a 45 deg



A variety of processes occur when hyperthermal ions collide on SAM surfaces. Ions resulting from surface-induced dissociation (SID), atom/group transfers, and surface sputtering can be directly detected. Neutralized products can be indirectly monitored as relative amounts of total ion currents (TICs) generated by summing all resulting ions collected at the detector; surfaces that neutralize a larger percentage of the ion beam have relatively lower TICs when compared with surfaces that neutralize a smaller percentage of ions.

Low Energy Ion-surface Collisions

(Reactive Ion Scattering Spectrometry)