Confocal Raman microspectroscopy has been widely shown to be a valuable tool with high resolution and sensitivity to molecular and structural features. In this study, we applied this method on the measurement of inner molecular structure of APTES self-assembled monolayer (SAM), with depth resolution 0.1nm.

Microscopic confocal Raman spectroscopy with excitation wavelength of 785 nm was used to record the spectra. The sample, APTES SAM, was adsorbed with Ag nanoparticles to enhance Raman signal and obtain more subtle structure information. With the laser beam moving down, Raman spectra were recorded in Z-scanning mode (Exposure time was 1s). Figure 1 is the depth profiling of APTES SAM, which shows the intensity variations of some specific peaks with laser moving. The axis of x (from 0 to 10) stands for the laser moving direction, from the start position in displacement toward substrate for the depth scanning. There are three Raman assignments shown in figure 1, being attributed to Ag/NH$_2$, SiO and NH$_2$ groups’ vibrations. The intensity variations of these three peaks highly correspond to the chemical structure of APTES SAM in Figure 1. Thus we could indicate that the range of gray area (3.5 to 5.5) could be the thickness range of the APTES SAM. Moreover, we succeeded to measure and identify the Raman intensity variations of specific groups’ vibrations in APTES at each point of the depth scan, such as Ag/NH$_2$, SiO and NH$_2$. 

![Fig. 1 Depth profiling of APTES SAM](image.png)