A brief description of combined LT-STM and nc-AFM system

An integrated scanning probe system consists of ScientaOmicron Low-Temperature Scanning Tunneling Microscopy (LT-STM) combined with a versatile dynamic mode so called non-contact Atomic Force Microscopy (nc-AFM) with typical operating condition in ultra-high vacuum (base pressure of 10^{-11} mbar) and low temperature (4.5-77K). Recent breakthrough in the surface science community is to extend further the capability of conventional AFM tapping mode by using qPlus AFM sensor in order to resolve the internal molecular structure. Furthermore, this technique allow to directly imaging the chemical bond in real space with sub-molecular resolution. The integrated setup is also fully equipped with MBE preparation chamber situated next to the analysis chamber. This chamber comprises of several supporting components such as ion gun sputtering, e-beam evaporators and Knudsen cells for sample cleaning and organic molecular deposition facility. Our recent subject of interest in the group is to investigate the emergence of a monolayer 2D layered material such as transition metal dichalcogenides by employing simultaneous STM and nc-AFM imaging to demonstrate an atomically-resolved thin semiconductors of MX_2. M is a transition metal atom (Mo, W, etc.) and X is a chalcogen atom (S, Se, or Te). For instance, a high-resolution of nc-AFM image of single layer of $MoSe_2$ on HOPG acquired in constant height mode is presented below. In addition, nc-AFM technique has other powerful capability to offer: atomic manipulation using a functionalized-tip, force spectroscopy, grid spectroscopy and conventional scanning tunneling spectroscopy.