

Development of a Standardized Platform for Atomically Precision Device Fabrication

Atomically precise fabrication has been a long awaited vision within the research community. Recent advances in scanning tunneling microscope (STM) based hydrogen depassivation lithography (HDL), including the ZyVector control system developed by Zyvex Labs, advances in precursor chemistry for placement of individual dopant atoms and selective atomic layer deposition for etch masking are beginning to enable the fabrication of the first generations of devices and structures produced using atomically precise manufacturing (APM) techniques.

One of the remaining obstacles to producing practical devices using the APM toolkit is the extreme difficulty of locating these nanometer scale structures on the larger silicon surface after fabrication within the STM chamber. We are developing standardized substrates which will contain alignment marks for all three levels of lithography needed to realize fully functional devices: i.e. optical, e-beam and STM HDL. Additionally, these substrates will contain bonding pad areas with highly doped patches to facilitate reliable contacting of APM produced delta layer structures and devices. These substrates will allow for a standardized research platform for the development of APM-based systems and allow more direct comparison of performance between devices.