# *In-situ* device fabrication in Molecular Beam Epitaxy Cluster

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Hybrid devices made of heterostructure are demanded in various research fields, such as semiconductor-superconductor nanowires-based quantum information processing devices. Not only the quality of each single material element but also surfaces and interfaces' quality are highly influential to the performance of final devices.

Advanced Nanomaterials and Devices (AND) group extends its expertise in control of semiconductor nanowire crystal structure and morphology to heterostructure including heteroepitaxy by constructing four-chamber molecular beam epitaxy cluster. III-V, II-IV-VI, metal, and dielectric materials are loaded to its dedicated chamber. Such MBE cluster ensures sample growth and transfer under ultrahigh vacuum condition. Bi-material heterostructure and even more complex system are feasible, such as InSb/CdTe[1], InSb/Sn[2], PbTe/Pb[3], PbSnTe/$HfO_2$, PbSnTe/MgO. Furthermore, *in-situ* heterostructure device fabrication is enabled by involving sophisticate wafer patterning processes and by taking advantage from shadow effect engineering. Devices of novel structure and high quality are accessible comparing to the ones fabricated via conventional *ex-situ* processes. Reproducibility and scalability are also secured by utilizing MBE cluster facility.

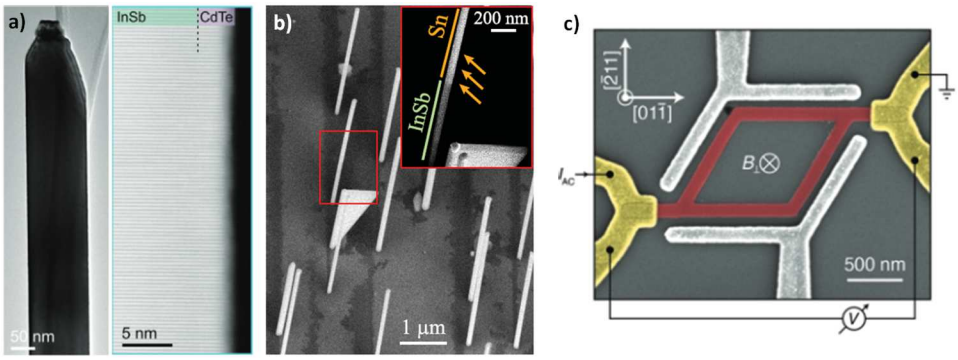


Figure 1. a) TEM of InSb/CdTe core shell nanowire; b) InSb/Sn heterostructure grown in MBE by shadow effect engineering; 3) Aharonov–Bohm device enabled by InP/PbTe heteroepitaxy.

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