III-V Nanostructures Grown by Molecular Beam Epitaxy (MBE)

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III-V nanostructures are the subject of extensive research since the last 20 years due to their strong potential in optoelectronics and photovoltaics. The superior physical properties of III-V semiconductors can be further improved with the advantages of nanotechnology. III-V nanowires and nanoscale membranes are examples of such sophisticated structures. Earlier, we have demonstrated that GaAs and InAs nanowires can enable the integration of silicon based technology with III-Vs. [1] Thanks to their small footprint nanowires can be grown on highly lattice mismatched substrates with high crystallinity. Such a combination would not only combine direct band gap and high mobility with Si but array configuration can be further optimized to maximize light absorption for potential photovoltaic devices. In addition to their strong potential in photovoltaics and optoelectronics nanowires can be utilized in a wide range applications; for instance InAs and $InAs_xSb_{1-x}$ nanowires are very interesting platforms to study spin transport.

Among these examples nanoscale membranes can be an interesting medium to study various quantum optical effects. It has been shown that quantum wells of different thicknesses can be grown on GaAs nanoscale membranes and Qdots embedded in AlGaAs shell spontaneously form at the apexes of the GaAs/AlGaAs nanowires. [2][3] In addition to fundamental studies such heterostructures might have the potential in quantum information technology in the future.

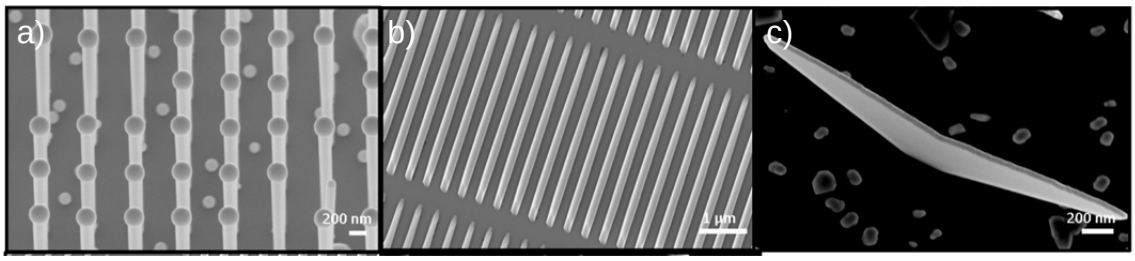

Figure: III-V nanostructures grown by MBE a) GaAs NWs b) GaAs nanoscale membranes c) InAs V-shaped nanomembranes

References :

1- Heiss, M. *et al.* III-V nanowire arrays: growth and light interaction. *Nanotechnology* **25,** 014015 (2014).

2- Tutuncuoglu, G et al. *Towards 1D GaAs/AlGaAs Heterostructures* submitted.

3- Heiss, M. *et al.* Self-assembled quantum dots in a nanowire system for quantum photonics. *Nat Mater* **12,** 439–444 (2013)