Selective area epitaxy for next generation quantum computing and photovoltaics

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Nanowires are filamentary crystals with a diameter tailored at nanoscale dimensions. The small footprint of freestanding nanowires provides advantages from the epitaxial point of view, as it relaxes the requirement of polarity and lattice matching [1]. While for a couple of decades most nanowire structures were obtained in the free-standing form, recently a new trend has emerged which his to directly synthesize nanowires in the horizontal configuration [2]. This has the advantage that one can directly organize the nanostructures in the way they are going to be used as a device and in a scalable manner. Such kind of nanowires is obtained by selective area epitaxy, SAE. It consists in restricting growth on non-masked regions of a substrate. The mask consists of a material on which growth precursors will not stick at the growth temperature, typically an oxide.

In this talk we will explain how selective area epitaxy can be used to obtain nanowire networks as well as complex heterostructures [3-6]. We will compare the mechanisms in III-Vs, Ge and Zn_3P_2 as well as the envisioned applications in quantum computing and solar energy harvesting. Finally, we will outline how selective area growth can even provide a path for the creation of high quality textured Zn3P2 thin films, providing a path for the use of this earth abundant absorber in photovoltaics [6-9].

References

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