

Growth and properties of semiconductor nanowires

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Nanowires are one-dimensional crystals with a tailored diameter between few and few tens of nanometer. Thanks to this special morphology and the small dimensions, they have been proposed as advanced building blocks for a manifold of applications ranging from chemical or biological sensors to energy harvesting. Among the different materials that have been synthesized in the form of nanowires are compound semiconductors. This has allowed for the first time the defect-free integration of III-V semiconductors on the silicon platform. The perspectives are numerous, ranging from the integration of the functionality of III-Vs (high mobility, bright optical emission...) with the CMOS technology.

In this seminar I will present the state of the art of nanowire growth, with a special emphasis in the growth of ultra-pure III-As nanowires by molecular beam epitaxy [1,2]. I will discuss the growth mechanisms as well as the issues allowing the growth of III-V nanowires on silicon. I will continue by expanding the possibilities of this technique for creating other kinds of heterostructures on the nanowires themselves. These will include prismatic quantum wells, quantum dots and crystal phase heterostructures [3-6]. The optical properties of the quantum heterostructures are characterized by micro-photoluminescence and cathodoluminescence at temperatures down to 4.2K.

Finally, the application of nanowires for next generation solar cells and the possible contribution to the generation of solar fuels will be discussed [7,8].

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