



ΣΕΜΙΝΑΡΙΟ

III-As nanowires: new potentials for an old semiconductor

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Abstract

After more than fifty years of fruitful research, III-As semiconductors have stimulated many breakthroughs in physics and thin-film technology of photonics and electronics. The reason is their direct band gap and high electron mobility, as well as the possibility to tailor their electronic properties using (qua-) ternary alloys with appropriately selected chemical compositions. More recently, III-As semiconductors in the form of nanowires have exhibited new potentials for a wide variety of future applications in nanotechnology, ranging from energy-efficient electronic switches to nanosized lasers, including the possibility for monolithic integration in the mainstream Si technology.

In this seminar, I will first describe the bottom-up fabrication of GaAs nanowires on Si substrates using the very special self-catalyzed vapor-liquid-solid growth mode. Then I will focus on GaAs/(In,Ga,Al)As core/shell heterostructured nanowires. Owing to the large lattice-mismatch with the shell, the thin GaAs core develops an unusually large hydrostatic strain, which strongly modifies the electronic properties. In this way, we can optimize the GaAs properties for photonic devices across the near-infrared range or for high-speed transistors. Finally, I will talk about the growth and emission properties complex quantum dots in nanowires, which is a promising scheme for the realization of on-demand sources of single photons or entangled photon pairs in quantum technology systems.