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Band-gap engineering in III-V nanowires ANN I. PERSSON, MIKAEL T. BJÖRK, SÖREN JEPPESEN, MAGNUS W. LARSSON, L. REINE WALLENBERG, LARS SAMUELSON, Solid State Physics, Lund University —
Freestanding nanowires can be used for probing the physics of one-dimensional transport, as well as creating new devices based on quantum physics. Growth of epitaxially nucleated nanowires is usually described by the vapor-liquid-solid (VLS) growth mechanism, where metallic seed particles, are used to form a eutectic system with the growth material. We have strong indications that the seed particle, often described as being in liquid phase, is in solid phase and that we have a growth regime different from VLS, based on a solid-phase diffusion. Chemical Beam Epitaxy is used as growth technique, with the advantage of a fast response in the flow at the substrate surface and a slow growth rate. This makes it possible to realize size-controlled heterostructures with atomically abrupt changes in materials within a single nanowire. Here we present results of $InAs_{1-x}P_x$ heterostructures in InAs nanowires, showing the alloying mechanism of As and P as a function of the As/P ratio. The results have been characterized by electrical measurements and TEM giving us information necessary to carry out band-gap engineering in nanowires based on the $InAs_{1-x}P_x$ system.

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