

GaAs Core / SrTiO₃ Shell Nanowires Grown by Molecular Beam Epitaxy

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Perovskite oxides possess a wide range of properties [1, 2] which can lead to the development of multifunctional devices when coupling with III-V semiconductor nanowires (NWs). However the epitaxial growth of perovskite oxides on III-V NWs is still rather challenging. By the As capping / decapping method (Figure 1a), the GaAs NWs (or GaAs / AlGaAs NWs) could be transferred among different separated reactors without oxidizing or contaminating the GaAs (or AlGaAs) facets [3], which is of great necessity for the further functional oxide shell growth. Then, by means of the two-steps SrTiO₃ growth method [4], we have obtained a partially oriented SrTiO₃ shell covering the GaAs NWs (Figure 1b), proving the possibility to fabricate the monocrystalline epitaxial shell of functional oxides integrated on semiconducting NWs [5]. As revealed by XPS spectra and TEM images, the interface is not abrupt, which probably prevents a perfect epitaxial growth. The GaAs / SrTiO₃ NWs also showed a good thermal tolerance to an annealing up to 500 °C, benefiting the further growth of another functional oxide, such as the ferroelectric BaTiO₃, to construct the core / multi-shells NW array and the further practical devices.

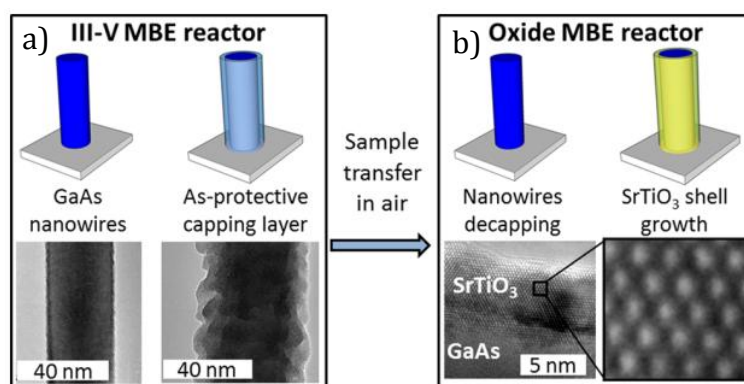


Figure 1: a) the As capping / decapping method for GaAs NWs against the surface oxidation and contamination. b) the two-steps method for the growth of the SrTiO₃ shell.

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