

Growth of Hexagonal Germanium on self-assisted GaAs Nanowires by MBE

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Group IV materials with hexagonal crystal structure have promising new electronic and optoelectronic properties [1]. Recently, hexagonal Si and Ge were grown on gold-catalysed wurtzite GaAs nanowires using crystal transfer method [2] with the possibility to tune the emission wavelength using SiGe alloys [3]. Even though it is easier to control the wurtzite phase of GaAs using gold, this catalyst is known to introduce unwanted impurities [4].

In this work we obtained the first growth of hexagonal Ge on self-assisted GaAs nanowires [5]. GaAs nanowires were grown in a molecular-beam epitaxy (MBE) reactor via self-assisted growth following the VLS method using Ga as a catalyst. An extended pure wurtzite segment was maintained by tuning the V/III ratio to appropriate value [6]. Following the growth of the GaAs core, Ge shell has been grown with different thicknesses. High-resolution scanning transmission electron microscopy (STEM) and dark field transmission electron microscope (TEM) confirmed the long extended hexagonal phase of Ge. The Ge surface chemistry was studied by X-ray photoelectron spectroscopy (XPS).

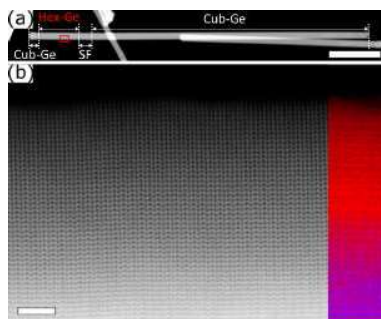


Figure 1 (a) STEM-HAADF overview of a NW. Scale bar is 500 nm. (b) High resolution STEM-HAADF image of the WZ structure with Ga (blue) and Ge (red) maps. Scale bar is 2 nm. The region shown in (b) is highlighted by a red rectangle in (a).

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