

GROWTH AND CHARACTERIZATION OF HEXAGONAL GERMANIUM ON SELF-ASSISTED GAAS NANOWIRES BY MBE

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Hexagonal Ge is predicted to have novel electronic and optoelectronic properties [1]. So far, hexagonal (Si)Ge with direct bandgap and wavelength tunability have been fabricated using nanowires with gold as a catalyst [2]. However, it is not compatible with the current CMOS technology [3].

In our work, hexagonal Ge has been grown on the facets of self-assisted GaAs nanowires by MBE using VLS mechanism [4]. An extended pure wurtzite segment was maintained by tuning the V/III ratio to appropriate values [5]. Following the growth of the GaAs core, a Ge shell has been grown with different thicknesses. The crystal structure of the nanowires has been characterized with high-resolution scanning transmission electron microscopy (STEM) and dark field transmission electron microscope (TEM). The Ge surface chemistry was studied by X-ray photoelectron spectroscopy (XPS), and photoluminescence spectroscopy (PL) was performed to investigate the optical properties of the hexagonal Ge phase.

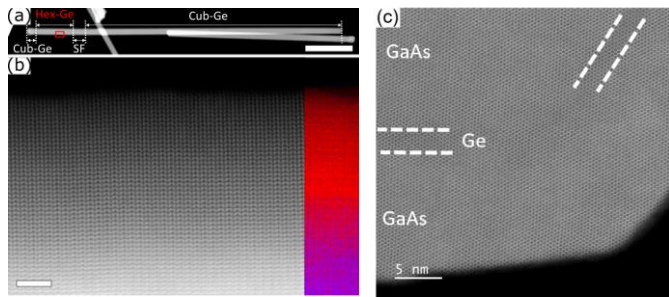


Figure 1: (a) STEM-HAADF overview of a NW. Scale bar is 500 nm. (b) High resolution STEM-HAADF image of the WZ structure with Ga (blue) and Ge (red) maps. Scale bar is 2 nm. The region shown in (b) is highlighted by a red rectangle in (a). (c) NW cross-section with lines indicating the hexagonal Ge.

Références :

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